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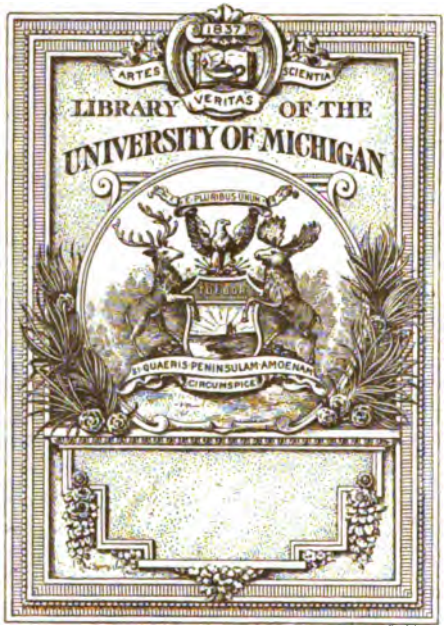
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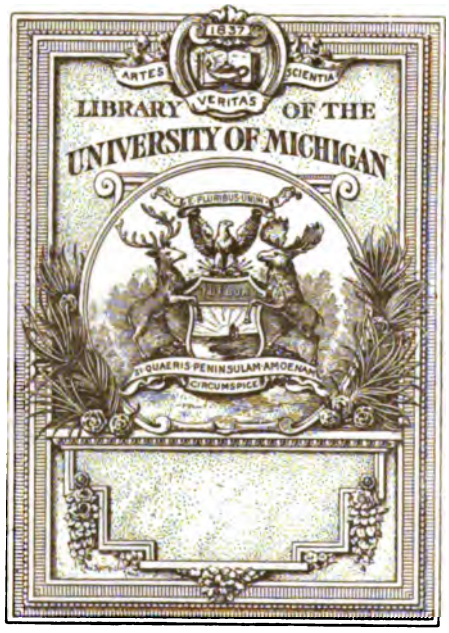
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NEW ENGLAND

Cotton Manufacturers' Association.

Proposal for

.....

Membership of

.....

Application Received

Notice to Members.

To make the Cotton Manufacturers' Association an absolutely representative body it must include as many as possible of those who are eligible for membership. It has been found that many who were eligible and desired to join had not done so because not invited. It is hoped that every member will present the matter to non-members among his associates. The accompanying blank proposition for membership can be detached from the cover at the row of perforations.

New Engl
Cotton Manufacturers'

Founded July 26, 1865. Incorporated

ROOM 501 JOHN HANCO

No. 178 Devonshire Street, and No

PROPOSAL FOR ME

(When filled out, to be mailed to the Secretary, P. O. Mass., in time for action by the Board of Government, at lea a meeting of the Association.)

Mr. .....

Position, ...

P. O. Address, ...

is proposed for ..... *membership in the* NEW
active or associate

MANUFACTURERS' ASSOCIATION *by* .....
signature of member pro

a member of the Association.

Experience of Applicant, (Please state, in full, particulars of detail, and nature of work, as fully as conven

.....

.....

.....

.....

.....

.....

The undersigned certifies that the above statements a agrees that, if elected to the Association, he will be govern as long as his connection with it shall continue.

Date, ... 189 .

signature of candidate.

338.46
A28
A85c

TRANSACTIONS

OF THE

New England

COTTON MANUFACTURERS' ASSOCIATION,

Founded April 20, 1865. Incorporated Dec. 1, 1894.

No. 62.

ANNUAL MEETING.

HELD AT CHIPMAN HALL, TREMONT TEMPLE,
BOSTON, MASS., APRIL 28-29, 1897.

Office of the Association:

501 John Hancock Building, No. 178 Devonshire St.,
and No. 35 Federal St., Boston, Mass.

WALTHAM, MASS.:
PRESS OF E. L. BARRY,
1897.

Entered according to Act of Congress
in the Year 1897
By the New England Cotton Manufacturers' Association,
in the Office of The Librarian of Congress
at Washington.

By vote of the Board of Government, the price of the *Transactions* is $5.00 per copy to non-members. The price of this issue and the one previous is $1.00 each to members, and the prices of copies previous to Volume 62, is 50 cents to members, but each member is entitled to a copy as a part of the privilege of membership.

CHARTER.

No. 6091.

Commonwealth of Massachusetts.

BE IT KNOWN, That whereas, EDWARD W. THOMAS, C. J. H. WOODBURY, WILLIAM J. KENT, F. M. MESSENGER, HARRY T. WHITIN, ARTHUR H. LOWE, ALBERT F. KNIGHT, ALFRED M. GOODALE, FRED C. MCDUFFIE and GEORGE W. BEAN have associated themselves with the intention of forming a corporation under the name of the NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION, for the purpose of encouraging scientific investigation and experiment as to the methods of manufacturing cotton; collecting and imparting information relating to this industry, promoting social intercourse among its members; and establishing and maintaining a library of works on textiles in the city of Boston, and have complied with the provisions of the Statutes of this Commonwealth in such case made and provided, as appears from the certificate of the President, Treasurer and Directors of said corporation, duly approved by the Commissioner of Corporations, and recorded in this office.

Now, Therefore, I, WILLIAM M. OLIN, Secretary of the Commonwealth of Massachusetts, do hereby certify that said EDWARD W. THOMAS, C. J. H. WOODBURY, WILLIAM J. KENT, F. M. MESSENGER, HARRY T. WHITIN, ARTHUR H. LOWE, ALBERT F. KNIGHT, ALFRED M. GOODALE, FRED C. MCDUFFIE and GEORGE W. BEAN, their associates and successors, are legally organized and established as and are hereby made an existing corporation under the name of the

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION,

with the powers, rights and privileges, and subject to the limitations, duties and restrictions which by law appertain thereto.

Seal of the Commonwealth of Massachusetts.

Witness my official signature hereunto subscribed, and the seal of the Commonwealth of Massachusetts hereunto affixed this first day of December, in the year of our Lord one thousand eight hundred and ninety-four.

WILLIAM M. OLIN,
Secretary of the Commonwealth.

Commonwealth of Massachusetts.

(Acts of 1895, Chap. 163.)

AN ACT TO AUTHORIZE THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION TO HOLD ITS MEETINGS WITHOUT THE COMMONWEALTH.

Be it enacted, etc., as follows:

SECTION 1. The New England Cotton Manufacturers' Association is hereby authorized to hold its meetings in any state or territory of the United States and in the District of Columbia; provided, however, that its annual meeting shall be held in this Commonwealth at least once in five years.

SECT. 2. This act shall take effect upon its passage. [Approved March 23, 1895.]

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

FOUNDED APRIL 20, 1865.

INCORPORATED DECEMBER 1, 1894.

CONSTITUTION AND BY-LAWS.

ACTIVE MEMBERS.

ARTICLE 1. Any person who is actively engaged as President, Treasurer, Agent, Superintendent or Manager in the manufacture, printing or finishing of cottons shall be eligible for active membership.

ELECTION OF MEMBERS.

ARTICLE 2. All nominations for membership shall be made in writing, at least one week before the date of any regular meeting, and shall be considered by the Board of Government, and reported to the meeting, favorably or adversely, for the action of the Association. *Provided*, that in case the Board shall decide to report adversely upon any nomination, the member who shall have made it shall be informed of the intention so to report, in order that he may have an opportunity to withdraw the name. Upon such report active members may be admitted, if they obtain a majority of votes of the members present and voting therefor, by acceptance in writing, and paying an admission fee of ten dollars, and maintaining their membership by the payment of an annual assessment not exceeding ten dollars. Any member failing to pay two successive assessments shall cease to be a member at the end of six months from the date when such second assessment shall become due. Any member may withdraw from the Association upon payment of all arrearages, first giving notice of his intention so to do, in writing, to the Secretary, and the Board of Government may accept such resignation; and any member may be expelled for cause,

at any regular meeting, two-thirds of the members present voting therefor.

ASSOCIATE MEMBERS.

ARTICLE 3. Persons engaged in the manufacture of cotton or cotton fabrics, or the manufacture of textile machinery, or industries kindred to the cotton manufacture, may become associate members of the Association. The methods of application, nomination, election and withdrawal from the Association being under the same conditions as those provided for active members in Article 2, excepting that this class of membership does not carry with it the privilege of voting or speaking, except by permission from the Board of Government or a vote of the Association to allow permission.

The initiation fee for associate members shall be twenty-five dollars, and the annual assessment shall be double the sum annually voted for active members.

Associate members may be expelled by a majority vote of the Board of Government.

HONORARY MEMBERS.

ARTICLE 4. Honorary members may be elected, when recommended by the Board of Government, at any regular meeting of the Association, who shall be enrolled as such, and shall be entitled to attend the meetings of the Association and participate in its proceedings, without the right to vote. They shall not be subject to payment of admission fees or assessments. No person actively engaged in cotton manufacture shall be eligible to honorary membership.

ARTICLE 5. It shall be the duty of all members of the Association to make returns to the Secretary of such statistics as may be called for by him, under the direction of any committee duly appointed for the collection of statistics, when not incompatible with private interests.

OFFICERS.

ARTICLE 6. The officers of this Association shall be a President, two Vice-Presidents, six Directors, a Treasurer, Secretary, and Auditor of Accounts.

ELECTION OF OFFICERS.

ARTICLE 7. At each annual meeting there shall be chosen by ballot a President, two Vice-Presidents and two Directors; the President and Vice-Presidents to serve one year, and the two Directors shall be chosen for terms of three years.

DUTIES OF OFFICERS.

ARTICLE 8. The President, or in his absence the senior Vice-President present, shall preside at all meetings of the Association and of the Board of Government. All officers shall hold their respective offices until their successors shall be chosen and accept their positions.

ARTICLE 9. The President, Vice-Presidents and Directors shall constitute a Board of Government, and have under their care and direction all matters pertaining to the management of the Association; and five of their number shall constitute a quorum for the transaction of business. Meetings of the board may be called by the President, at such time and place as he may deem expedient, giving each member a written or printed notice of the same at least five days before the day of meeting. At their first meeting the board shall elect a Treasurer, Secretary, and Auditor of Accounts for the year ensuing, and fix the amount of compensation of the Secretary. All vacancies in their board occasioned by death or resignation shall be filled by the board; and the persons so elected shall hold their offices until the next annual meeting. The board may, from time to time, as they shall deem expedient, appoint committees, from among their own board or from the members at large, to collect statistical information, examine new inventions or processes in manufacturing goods, as also to prepare essays on subjects of interest to the Association.

ARTICLE 10. The Treasurer shall keep a book in which all receipts and payments of money shall be entered, collect all moneys due the Association, and disburse the same upon the written order of the Board of Government. At the annual meeting in each year he shall make an exhibit of his accounts, or oftener if the Board of Government require it. He shall notify the members of assessments voted, and cause them to be collected in a reasonable time.

ARTICLE 11. The Secretary shall attend all meetings of the Association and of the Board of Government, and keep accurate records of

their doings. In the absence of the Secretary at any meeting, a Secretary *pro tem.* may be appointed by the presiding officer, who shall be sworn to do all things, while in office, required of the Secretary.

ARTICLE 12. The Auditor shall examine the accounts of the Treasurer annually, and report at each meeting the state of the finances.

MEETINGS.

ARTICLE 13. The annual meeting of the members of the Association shall be held on the last Wednesday of April, or at such other time, and at such hour and place as the Board of Government may appoint. There shall also be a semi-annual meeting of the Association on the last Wednesday of October, in each and every year, or at such other time, and at such place and hour as the Board of Government may appoint.

Special meetings may be called by the Board of Government whenever they deem it expedient, or upon the written application of any ten members, made to the Secretary.

ARTICLE 14. All meetings of the members of the Association shall be in pursuance of a written or printed notice, addressed to each member, with the name of the President or Secretary attached thereto, and deposited in the Post Office ten days at least before the day of meeting, specifying the time and place of meeting; and at all such meetings fifteen members shall constitute a quorum for the transaction of business.

ARTICLE 15. Amendments to the By-Laws may be made at any stated meeting of the Association by a two-thirds vote; *provided*, notice of such proposed amendment be given in writing at a previous meeting, and also notice be given to each member by the Secretary, of the pendency of such amendment, ten days at least before any such meeting.

BOARD OF GOVERNMENT.

1897.

PRESIDENT.

RUSSELL W. EATON, ... BRUNSWICK, ME.

VICE-PRESIDENTS.

FRED C. McDUFFIE, ... LAWRENCE, MASS.
HENRY T. WHITIN, ... NORTHBRIDGE, MASS.

DIRECTORS.

ALBERT F. KNIGHT, ... QUIDNICK, R. I.
HERBERT L. PRATT, ... LEWISTON, ME.
STEPHEN A. KNIGHT, ... PROVIDENCE, R. I.
JOHN ECCLES, ... TAFTVILLE, CONN.
CHAS. H. RICHARDSON, ... LOWELL, MASS.
GEORGE H. HILLS, ... FALL RIVER, MASS.

AUDITOR.

JACOB H. SAWYER, ... BOSTON, MASS.

SECRETARY.

C. J. H. WOODBURY, P. O. Box 3672, BOSTON, MASS.

OFFICE OF THE ASSOCIATION:

ROOM 501, JOHN HANCOCK BUILDING, 178 DEVONSHIRE STREET,
BOSTON, MASS.

OFFICERS OF THE ASSOCIATION.

FROM THE FIRST ORGANIZATION.

PRESIDENTS.

Ezekiel A. Straw,	1865–78	Henry F. Lippitt,	1888–89
Amos D. Lockwood,	1878–80	Walter E. Parker,	1889–92
John Kilburn,	1880–83	Robert McArthur,	1892–94
William C. Lovering,	1883–85	Edw. W. Thomas,	1894–95
Richard Garsed,	1885–86	A. M. Goodale,	1895–96
J. S. Ludlam,	1886–88	Arthur H. Lowe,	1896–97
		RUSSELL W. EATON,	1897–

VICE-PRESIDENTS.

Amos D. Lockwood,	1865–77	Walter E. Parker,	1885–89
William A. Burke,	1865–73	Richard B. Borden,	1886–88
John C. Palfrey,	1873–76	Arnold B. Sanford,	1888–91
Edward Atkinson,	1876–78	Robert McArthur,	1889–92
A. G. Cumnock,	1877–80	Simeon B. Chase,	1891–93
Charles Nourse,	1878–81	E. W. Thomas,	1892–94
William F. Goulding,	1880–83	A. M. Goodale,	1893-95
Richard Garsed,	1881–85	William J. Kent,	1894–97
J. S. Ludlam,	1883–86	FRED. C. McDUFFIE,	1895–
		HENRY T. WHITIN,	1897–

DIRECTORS.

J. S. Davis,	1865–69	A. M. Wade,	1868–69
Charles Nourse,	1865–78	D. J. Johnston,	1869–70
Phineas Adams,	1865–74	A. G. Cumnock,	1869–77
William P. Haines,	1865–69	F. E. Clarke,	1869–75

DIRECTORS.—Concluded.

Thomas J. Borden,	1865–78	John Kilburn,	1870–80
Daniel D. Crombie,	1865–68	William P. Haines,	1874–78
Cyrus I. Barker,	1875–80	Robert McArthur,	1886–89
Hervey Kent,	1877–81	S. S. Spencer,	1887–90
David J. Johnston,	1878–82	E. W. Thomas,	1888–92
Walter Paine, 3d,	1878–80	William W. Whitin,	1888–93
Chas. L. Lovering,	1878–83	Robert R. Smith,	1889–92
Richard Garsed,	1880–81	Alfred M. Goodale,	1890–93
William H. Jennings,	1880–83	William J. Kent,	1891–94
Chas. D. McDuffie,	1881–83	Herman F. Straw,	1891–93
Walter E. Parker,	1881–85	Fred C. McDuffie,	1892–95
John W. Danielson,	1881–85	George W. Bean,	1892–95
William E. Barrows,	1882–83	F. M. Messenger,	1893–95
Rufus A. Maxfield,	1883–86	Arthur H. Lowe,	1894-96
George W. Weeks,	1883–86	Henry T. Whitin,	1894–97
Henry S. Howe,	1883–87	Russell W. Eaton,	1896–97
Richard B. Borden,	1883–86	ALBERT F. KNIGHT,	1893–
O. S. Brown,	1885–91	JOHN ECCLES,	1895–
Henry F. Lippitt,	1885–88	STEPHEN A. KNIGHT,	1895–
Wilbur A. Stiles,	1886–88	C. H. RICHARDSON,	1897–
Stephen N. Bourne,	1886–91	GEORGE H. HILLS,	1897–

AUDITORS.

Benjamin Saunders,	1865–71	Henry D. Sullivan,	1873–82
John C. Palfrey,	1871–73	JACOB H. SAWYER,	1882

SECRETARY AND TREASURER.

Ambrose Eastman,	1865–94	C. J. H. WOODBURY,	1894

MEMBERS OF THE ASSOCIATION.

May 1, 1897.

Members of the Association are respectfully requested to scrutinize the following list, and advise the Secretary, P. O. Box 3672, Boston, Mass., of change in address, of any error in regard to their names.

As a number of members rejoined the Association after severing their first membership, the date of their earliest election is given.

HONORARY MEMBERS.

George Arms	Grand Hotel	New York City	Oct. 16, 1872.
Ambrose Eastman	53 State St.	Boston, Mass.	Sept. 27, 1894.
Samuel Webber	Hydraulic Engineer	Charlestown, N. H.	Apr. 28, 1897.

ACTIVE MEMBERS.

Stephen I. Abbott	Agt. Lockwood Co.	Waterville, Me.	Apr. 21, 1869.
Alfred E. Adams	Supt. Whitinsville Cotton Mills	Whitinsville, Mass.	Apr. 27, 1887.
John S. Adams, Jr.	Supt. Adams Bros. Mfg. Co.	Adams, Mass.	Apr. 29, 1896.
Stephen L. Adams	Treas. Stafford Mfg. Co.	Central Falls, R. I.	Apr. 24, 1895.
Joseph D. Aiken	Ponemah Mills	Taftville, Conn.	Oct. 28, 1891.
F. S. Akin	Supt. Cornell Mills	Fall River, Mass.	Sept. 27, 1894.
Charles T. Aldrich	Treas. Aldrich Mfg. Co.	Box 34, Providence, R. I.	Apr. 28, 1886.
George E. Ames	Mech. Supt. Lawrence Mfg. Co.	Lowell, Mass.	Apr. 24, 1895.
William Ames	Treas. Fletcher Manufg. Co.,	Box 83, Providence, R. I.	Apr. 30, 1879.
Charles B. Amory	Treas. Hamilton Manufg. Co.	70 Kilby St., Boston, Mass.	Apr. 25, 1894.
John W. Arrington	Treas. & Agt. Edna Cotton Mills	Reidsville, N. C.	Oct. 24, 1895.
Abel T. Atherton		Bayside, Warwick, R. I.	Oct. 16, 1872.
Edward Atkinson	Prest. Boston Mfrs. Mu. Fire Ins. Co.	Boston, Mass.	Apr. 19, 1871.
Edward W. Atkinson	Stoddard, Haserick, Richards Co.	152 Congress St., Boston, Mass.	Oct. 27, 1886.
H. C. Atwood	Treas. Williamsville Manufg. Co.	Killingly, Conn.	Apr. 29, 1885.
James A. Atwood	Agt. Wauregan Mills	Wauregan, Conn.	Oct. 28, 1891.
John Walter Atwood	Supt. Wauregan Mills	Wauregan, Conn.	Oct. 24, 1895.

W. E. Atwood	Secy. and Asst. Treas. Williamsville Manufg. Co.	Killingly, Conn.	Sept. 27, 1894.
Geo. A. Ayer	Supt. City Manufg. Corporation	New Bedford, Mass.	Apr. 24, 1895.
Charles L. Bailey	Gen. Supt. Boston Manufg. Co.	Box 143, Waltham, Mass.	Sept. 27, 1894.
Henry A. Bailey	Agt. Chicopee Manufg. Co.	Chicopee Falls, Mass.	Oct. 25, 1893.
Edwin H. Baker	Bliss, Fabyan & Co.	Box 2899, New York City, N. Y.	Apr. 24, 1878.
Philip S. Baker	Treas. Crowders Mountain Cotton Mills,	Kings Mt., N. C.	Oct. 24, 1895.
Edward R. Ballou	Supt. Brighton Mills	540 West 23rd St., New York City	Apr. 25, 1894.
William P. Bancroft	Vice-Pres. Joseph Bancroft & Sons Co.	Wilmington, Del.	Oct. 31, 1883.
A. D. Barker	Agt. Avon Manufg. Co.	Lewiston, Me.	Apr. 19, 1871.
Lewis E. Barnes	Supt. Methuen Co.	Methuen, Mass.	Oct. 24, 1895.
William A. Barrell	Agt. Lawrence Duck Co.	Lawrence, Mass.	Apr. 30, 1884.
Edwin N. Bartlett	Supt. Sigourney and Rockdale Mills,	North Oxford, Mass.	Apr. 29, 1891.
Joseph P. Battles	65 Equitable Building	Box 1460, Boston, Mass.	Oct. 24, 1895.
George W. Bean	Agt. Androscoggin Mills	Lewiston, Me.	Apr. 17, 1872.
Truman Beckwith	Treas. Dyerville Manufg. Co.	Box 171, Prov., R. I.	Apr. 27, 1892.
W. N. Blackstone	Treas. Attawaugan Co.	Norwich, Conn.	Apr. 29, 1896.
William W. Blades	Gen. Supt. Lorraine Mfg. Co.	Pawtucket, R. I.	Oct. 25, 1893.
Nathaniel B. Borden	Treas. Barnard Manufg. Co.	Fall River, Mass.	Oct. 15, 1873.
Richard B. Borden	Treas. Richard Borden Mfg. Co. Treas. Troy C. & W. Mfg. Co.	Fall River, Mass.	July 18, 1866.
Thomas J. Borden	Pres. Richard Borden Manufg. Co.	Box 118, Fall River, Mass.	Apr. 20, 1865.
E. S. Boss	Agt. Willimantic Linen Co.	Willimantic, Conn.	Oct. 29, 1879.
Stephen N. Bourne	Agt. Stark Mills	Manchester, N. H.	Oct. 21, 1869.
Frank A. Bowen	Supt. Appleton Co.	Lowell, Mass.	Apr. 28, 1897.
Arthur F. Brackett	Supt. Riverpoint and Arctic Mills	Riverpoint, R. I.	Oct. 24, 1895.
Ernest Bridge	Supt. Jas. Chadwick & Bro. Ltd.	Jersey City, N. J.	Apr. 24, 1895.
Christopher P. Brooks	Director Lowell Textile School	Lowell, Mass.	Apr. 28, 1897.
Henry R. Brown	Supt. Hope Co.	Phenix, R. I.	Apr. 28, 1897.
James W. Brown	Agt. Warren Cotton Mills	West Warren, Mass.	Oct. 24, 1895.
O. S. Brown	Agt. Salmon Falls Manufg. Co.	Salmon Falls, N. H.	Apr. 21, 1875.
E. C. Bucklin	Treas. Interlaken Mills, Treas. Harris Mfg. Co.	Box 289, Providence, R. I.	Apr. 25, 1883.
Robert Burgess	Supt. Pierce Mfg. Corp.	New Bedford, Mass.	Apr. 27, 1892.
Edward N. Burke	Lowell Machine Shop	Lowell, Mass.	Apr. 28, 1880.
W. R. Burnham	Treas. Uncasville Manufg. Co.	Norwich, Conn.	Apr. 29, 1885.
William D. Cadwell	Agt. Nashua Mfg. Co.	Nashua, N. H.	Apr. 19, 1871.
John P. Campbell	Supt. New York Mills,	New York Mills, Oneida Co., N. Y.,	Sept. 22, 1896.
Byron F. Card	Agt. Howland Mills	New Bedford, Mass.	Apr. 25, 1888.
Arnold B. Chace, Jr.	Agt. Woonsocket Mills	Valley Falls, R. I.	Apr. 24, 1895.
George A. Chace	Treas. Bourne Mills	Fall River, Mass.	Apr. 25, 1877.

H. S. Chadwick	Pres. Dover Yarn Mill Pres. Dilling Cotton Mills	Charlotte, N. C.	Apr. 24, 1895.
Simeon B. Chase	Treas. King Philip Mills	Fall River, Mass.	Apr. 21, 1875.
Clarence N. Childs	Asst. Supt. Hamilton Manufg. Co.	Lowell, Mass.	Apr. 24, 1895.
Elmer G. Childs	Agt. Boston Duck Co.	Bondsville, Mass.	Oct. 26, 1892.
Jno. H. C. Church	Asst. Treas. Monument Mills	Gt. Barrington, Mass.	Apr. 28, 1897.
Alfred Clarke	Eastern Electric Light and Storage Battery Co.	Lowell, Mass.	Apr. 30, 1879.
Ernest E. Clark	Supt. Sutton Manufg. Co.	Wilkinsonville, Mass.	Apr. 29, 1896.
Frederick E. Clarke	Agt. Pemberton Co. Agt. Methuen Co.	Lawrence, Mass.	Apr. 20, 1865.
George A. Clark	Supt. Manchester Mills	Manchester, N. H.	Oct. 25, 1882.
Jeremiah Clark	Textile Machinery	277 Dutton St., Lowell, Mass.	Oct. 15, 1873.
E. N. Clemence	Sec. and Treas. Eagle & Phenix Mfg. Co. and Agt. for Receivers	Columbus, Ga.	Apr. 28, 1897.
W. H. Cloher, Jr.	Agt. Utica Cotton Co.	Capron, Oneida Co., N. Y.	Sept. 22, 1896.
Alonzo A. Coburn	Treas. Atherton Machine Co.	Lowell, Mass.	Apr. 25, 1888.
Josiah G. Coburn		Newton, Mass.	Apr. 20, 1865.
John A. Collins	Supt. American Linen Co.	73 Cottage St., Fall River, Mass.	Oct. 31, 1883.
Frank B. Comins	Vice-Pres. and Gen. Mgr. Aerphor Co.	P. O. Box 1555, Providence, R. I.	Oct. 28, 1891.
John J. Connell	Supt. Cohannet Mills	Taunton, Mass.	Apr. 27, 1892.
Alphonse S. Covel	Treas. Tremont and Suffolk Mills	P. O. Box 1716, Boston, Mass.	Oct. 31, 1877.
P. T. Creed	Supt. Hopewell Mills	Taunton, Mass.	Sept. 22, 1896.
John B. Cudlip	Supt. Gibson Cotton Mills	Marysville, N. Bruns.	Apr. 28, 1897.
H. H. Culver	Supt. Elizabeth Poole Mill	Taunton, Mass.	Apr. 28, 1897.
Henry S. Culver	Supt. Cotton Mill	Taunton, Mass.	Apr. 28, 1897.
A. G. Cumnock	Agt. Boott Cotton Mills	Lowell, Mass.	Oct. 28, 1885.
Andrew J. Currier	Mgr. Valley Falls Co.	Albion, R. I.	Apr. 25, 1888.
T. B. Dallas	Treas. Phœnix Cotton Mills Treas. Dallas Manufg. Co.	Nashville, Tenn. Huntsville, Ala.	Oct. 24, 1895.
Woodbury K. Dana	Treas. Dana Warp Mills	Westbrook, Me.	Apr. 25, 1888.
Albert W. Danforth	Supt. & Chief Engineer Shanghai Cot. Cloth Co., Shanghai, China	881 Bridge St., Lowell, Mass.	Apr. 27, 1881.
A. Lockwood Danielson	Treas. Quinebaug Co.	Box 900, Providence, R. I.	Sept. 27, 1894.
J. DeForest Danielson	Asst. Treas. Lockwood Co.	Providence, R. I.	Sept. 27, 1894.
John W. Danielson	Treas. Lockwood Co.	Box 900, Providence, R. I.	Jan. 15, 1868.
B. D. Davol	Pres. Barnard Mfg. Co.	P. O. Box 418, Fall River, Mass.	Apr. 25, 1877.
James C. Deane	Supt. Griswoldville Manufg. Co.	Griswoldville, Mass.	Apr. 25, 1894.
William P. Dempsey	Agt. Dempsey Bleachery and Dye Works,	Pawtucket, R. I.	Apr. 28, 1886.
Charles W. Dennett	Agt. Johnson Manufg. Co. Agt. Dunbar Mills Co.	North Adams, Mass.	Oct. 29, 1890.
Edward P. Dennis	Lowell Machine Shop	Lowell, Mass.	Apr. 25, 1888.
Charles A. Denny	Vice-Pres. and Gen. Mgr. American Card Clothing Co.	Leicester, Mass.	Apr. 25, 1888.

P. Y. DeNormandie	Supt. Potomska Mills	New Bedford, Mass.	Apr. 29, 1896.
Chas. Owen Dexter	Mgr. Canadian Col'd Cot Mills, Ltd.	Hamilton, Ont.	Apr. 24, 1895.
F. Dilling	Sec'y & Treas. Dilling Cotton Mills	Kings Mountain, N. C.	Oct. 24, 1895.
Chas. C. Diman	Agt. Whitman Mills	New Bedford, Mass.	Apr. 24, 1895.
Albert W. Dimick	Atlantic Cotton Mills	Lawrence, Mass.	Apr. 25, 1894.
Eben S. Draper	Agt. Draper Co.	Hopedale, Mass.	Oct. 31, 1888.
George A. Draper	Treas. Draper Co.	Hopedale, Mass.	Oct. 31, 1888.
George Otis Draper	Sec'y Draper Co.	Hopedale, Mass.	Apr. 24, 1895.
William F. Draper	Pres. Draper Co.	Hopedale, Mass.	July 17, 1867.
William F. Draper, Jr.	Draper Co.	Hopedale, Mass.	Oct. 29, 1890.
John Drowne	Supt. Cocheco Mfg. Co.	Dover, N. H.	Apr. 29, 1896.
Joseph M. Dunham	Supt. Merrick Thread Co.	190 Walnut St., Holyoke, Mass.	Oct. 26, 1892.
David H. Dyer	Mill Engineer	7 and 8 Pocassett Bank Building, Fall River, Mass.	Oct. 18, 1871.
William A. Eastman	Treas. Lowell Hosiery Co.	Lowell, Mass.	Apr. 24, 1878.
Russell W. Eaton	Agt. Cabot Manufg. Co.	Brunswick, Me.	Oct. 26, 1887.
John Eccles	Supt. Ponemah Mills	Taftville, Conn.	Apr. 27, 1892.
D. M. Ehrlich	Treas. Galveston Cotton Mills	Galveston, Texas.	Apr. 24, 1895.
Lawrence V. Elder		Dickinson, Texas	Oct. 27, 1886.
Oscar Elsas	Vice-Pres. Fulton Bag & Cotton Mills,	Atlanta, Ga.	Apr. 28, 1897.
Frederick W. Ely	Agt. Columbian Manufg. Co.	Greenville, N. H.	Apr. 25, 1888.
H. B. Estes	Agt. Continental Mills	Lewiston, Me.	Apr. 26, 1893.
William Evans	Supt. Richard Borden Mfg. Co.	Fall River, Mass.	Apr. 29, 1896.
C. E. Falls	Sec. and Treas. Enterprise Mills	Kings Mountain, N. C.	Oct. 24, 1895.
Herbert R. Farnum	Supt. Bernon Mills	Georgiaville, R. I.	Apr. 27, 1881.
Clifton L. Field	Treas. Massaemit Yarn Mills	Shattuckville, Mass.	Apr. 25, 1894.
Frank S. Field	Supt. Massaemit Yarn Mills	Shattuckville, Mass.	Oct. 24, 1895.
William Firth	Mgr. Am. Drosophore Co.	150 Devonshire St., Boston, Mass.	Apr. 25, 1888.
Charles H. Fish	Agt. Cocheco Manufg. Co.	Dover, N. H.	Apr. 27, 1887.
Henry E. Fisher	Agt. Atlanta Cotton Mills	Atlanta, Ga.	Oct. 24, 1895.
Herbert Fisher		Taunton, Mass.	Oct. 29, 1879.
William B. Fitz	Supt. West Boylston Manufg. Co.	Oakdale, Mass.	Oct. 26, 1892.
Frederick A. Flather	Foreman Lowell Machine Shop	Lowell, Mass.	Apr. 29, 1891.
M. F. Foster		Milford, N. H.	Apr. 17, 1872.
Philip H. Fowler		Gloucester City, N. J.	Nov. 30, 1881.
Edward W. France	Dir. of Philadelphia Textile Schools,	Broad and Pine Streets, Philadelphia, Pa.	Sept. 22, 1896.
C. H. Frisbie	Agt. Attawaugan Co.	Norwich, Conn.	Oct. 29, 1890.
William Galey	Pres. Aberfoyle Manufg. Co.	Chester, Pa.	Apr. 28, 1897.
William Gammell	Agt. Berkeley Co.	Providence, R. I.	Oct. 28, 1885.
James G. Garland		Biddeford, Me.	Oct. 29, 1879.

Richard Garsed . . . Wingohocking Mills, Frankford Sta. Philadelphia, Pa. . . Apr. 17, 1872.
James A. Gary . . . . Pres. Gary Manufg. Co. . . . . .
. . . . . 108 W. German St., Baltimore, Md. . Apr. 25, 1883.
John Gegenheimer . . . . . Old Orchard, Me. . . Apr. 30, 1890.
Charles E. Getchell . . Supt. Waltham Bleachery and Dye Works . . . . . .
. . . . . Waltham, Mass. . . . Oct. 30, 1889.
Daniel Gilligan . . . . Supt. Pocasset and Metacomet Mills Fall River, Mass. . . Apr. 29, 1896.
William C. Godfrey . . Agt. Indian Orchard Co. . . . . Indian Orchard, Mass. Oct. 29, 1890.
Alfred M. Goodale . . Treas. Boston Manufg. Co. . . . . .
. . . . . 50 State St., Boston, Mass. . . . . Apr. 25, 1883.
Charles J. Goodwin . . Indian Orchard Co. . . . . Indian Orchard, Mass. Oct. 18, 1871.
Charles H. Gorton . . Supt. Ballou Mills . . . . . Woonsocket, R. I. . . Apr. 25, 1894.
Marcellus Gould . . . Agt. Falls Company . . . . . Norwich, Conn. . . . Sept. 22, 1896.
William B. Gowdey . . Mill Supplies 40 Clifford St. Box 707, Providence, R. I. . . Apr. 30, 1890.
George P. Grant, Jr. . . Treas. Grant Yarn Co. . . . . Fitchburg, Mass. . . Sept. 27, 1894.
D. W. Gray . . . . . Supt. Skenandoa Cotton Co. . . . . Utica, N. Y. . . . . Oct. 26, 1892.
R. A. Gray . . . . . Supt. Rodman Manufg. Co. . . . . Allenton, R. I. . . . Apr. 24, 1895.
Stephen Greene . . . Mill Engineer and Architect . . . . . .
. . . . . 131 Devonshire St., Boston, Mass. . . . Oct. 27, 1886.
William C. Greene . . Gen. Mgr. Peace Dale Manufg. Co. . Peace Dale, R. I. . . Oct. 27, 1886.
Joseph Warren Greene . Supt. Hamilton Web. Co. . . . . Hamilton, R. I. . . . Apr. 29, 1896.
John Gregson . . . . Supt. Merchants Manufg. Co. . . . Fall River, Mass. . . Apr 24, 1895.
Frederick Grinnell . . Pres. Gen. Fire Extinguisher Co. . . New Bedford, Mass. . Apr. 24, 1878.
Arthur H. Gulliver . . Asst. Supt. Lonsdale Co. . . . . Ashton, R. I. . . . . Apr. 24, 1889.
B. F. Guy . . . . . Supt. Pelzer Manufg. Co. . . . . Pelzer, S. C. . . . . Apr. 24, 1895.

Frank J. Hale . . . . Agt. Pettee Machine Works . Newton Upper Falls, Mass. . Apr. 27, 1892.
Samuel Hale . . . . . Vice-Pres. and Gen. Manager Dixie . . . . . .
. . . . . Cotton Mills . . . . . La Grange, Ga. . . . Apr. 29, 1891.
William E. Hall . . . Supt. Boston Duck Co. . . . . Bondsville, Mass. . . Apr. 27, 1892.
Z. D. Hall . . . . . Supt. Berkshire Cotton Mfg. Co. . . . . .
. . . . . P. O. Box 963, Adams, Mass. . Oct. 29, 1879.
John H. Hambly . . . Treas. Quidnick Manufg. Co. . . . . .
. . . . . 49 Westminster St., Providence, R. I. . Apr. 24, 1895.
A. M. Hamilton . . . Supt. Parker Mills . . . . . Fall River, Mass. . . Apr. 28, 1897.
John F. Hamlet . . . . . P. O. Box 160, Fall River, Mass. . . Oct. 31, 1888.
Joseph O. Hannum . . Agt. Saratoga Victory Manufg. Co. . . . . .
. . . . . Victory Mills, Saratoga Co., N. Y. . Apr. 30, 1890.
Frank Harris . . . . . Hamlet Mills . . . . . Woonsocket, R. I. . Apr. 24, 1889.
Henry F. Harris . . . Treas. West Boylston Manufg. Co. . . . . .
. . . . . Box 282, Worcester, Mass. . . Apr. 30, 1890.
John J. Hart . . . . . Supt. Merrimack Print Works . . . Lowell, Mass. . . . Apr. 24, 1895.
A. M. Hathaway . . . Supt. H. N. Slater Mills . . . . . Webster, Mass. . . . Sept. 27, 1894.
Samuel E. Hathaway . Supt. Fall River Iron Works Co. . . Fall River, Mass. . . Sept. 27, 1894.
William Hathaway . . Supt. Barnard Manufg. Co. . . . . Fall River, Mass. . . Apr. 25, 1894.
William B. Hawes . . Treas. No. Dighton Cotton Co. . . Fall River, Mass. . . Oct. 24, 1895.

Alfred Hawkesworth	Supt. Merchants Manufg. Co.	Montreal, P. Q.	Apr. 26, 1893.
Fred Hawkesworth	Asst. Supt. Merchants Manufg. Co.	Montreal, P. Q.	Sept. 22, 1896.
Horace L. Hayden	Agt. Walhalla Cotton Mills	Walhalla, S, C.	Apr. 24, 1895.
William Hayes	Agt. Barker Mill	Auburn, Me.	Apr. 30, 1879.
W. G. Henderson	Agt. Shetucket Co.	Norwich, Conn.	Apr. 29, 1896.
James G. Hill	Supt. Lawrence Manufg. Co.	Lowell, Mass.	Jan. 15, 1868.
William R. Hill	Treas. Glasgow Manufg. Co.	South Hadley Falls, Mass.	Oct. 25, 1893.
Geo. H. Hills	Treas. Davol Mills & Stephens Mfg. Co.	Fall River. Mass.	Oct. 24, 1895.
John H. Hines	Agt. Queen City Cotton Co.	Burlington, Vt.	Sept. 27, 1894.
Charles H. Hobbs	Agt. Thorndike Co.	Thorndike, Mass.	Apr. 28, 1886.
Louis L. Hohn	Supt. Wm. Clark Thread Co.	122 High St., Westerly, R. I.	Apr. 28, 1897.
John Holland	12 Trackey St.	P. O. Box 96, Dover, N. H.	Oct. 31, 1877.
Gideon F. Holmes	Treas. and Gen. Mgr. Plymouth Cordage Co.	No. Plymouth, Mass.	Oct. 30, 1889.
George W. Holt	Agt. Monohansett Manufg. Co.	Putnam, Conn.	Oct. 29, 1879.
William P. Holt	Supt. Slatersville Mills	Box 315, Slatersville, R. I.	Oct. 25, 1893.
George L. Hooper	Mangr. Shaw Stocking Co.	Lowell, Mass.	Apr. 27, 1892.
Jno. Hopkinson	Gen. Mgr. Slayden & Kirksey Woolen Mills	Waco, Texas	Apr. 25, 1883.
Henry S. Houghton, Jr.	Supt. Paul Whitin Manufg. Co.	Northbridge, Mass.	Apr. 24, 1895.
W. C. Houston, Jr.	Pres. Hope Mills Manufg. Co.	333 Drexel Building, Philadelphia, Pa.	Apr. 28, 1897.
Elisha H. Howard	Agt. Harris Manufg. Co.	Providence, R. I.	Apr. 25, 1883.
Henry S. Howe	Lawrence & Co.	68 Chauncy St., Boston, Mass.	Oct. 31, 1877.
W. S. Hume	Supt. Dominion Cotton Mills, Ltd.	Montreal, P. Q.	Oct. 29, 1890.
Arthur W. Hunking	Agt. Mass. Mills, in Georgia	Lindale, Floyd County, Ga.	Apr. 24, 1895.
J. E. Jenckes	Treas. E. Jenckes Manufg. Co.	Pawtucket, R. I.	Apr. 24, 1895.
Frank A. Jenks	Agt. U. S. Cotton Co.	Central Falls, R. I.	Apr. 28, 1897.
David L. Jewell	Agt. China. Webster & Pembroke M.	Suncook, N. H.	Apr. 20, 1865.
David S. Johnston	Treas. Cohoes Iron Foundry & Mach. Co.,	Cohoes, N. Y.	Oct. 28, 1891.
W. T. Jordan	Mgr. Mountain Island Mfg. Co.	Mountain Island, N. C.	Oct. 24, 1895.
Frank E. Kaley	Treas. Morse & Kaley Mfg. Co.	Milford, N. H.	Oct. 24, 1895.
W. E. Keach	Supt. Grant Yarn Mills	47 School St., Fitchburg, Mass.	Oct. 26, 1892.
Roland R. Kelly	Supt. Williamstown Manufg. Co.	Williamstown Sta., Mass.	Nov. 30, 1881.
Joseph H. Kendrick	Agt. American Supply Co.	Box 850, Providence, R. I.	Apr. 30, 1879.
George E. Kent	Agt. Pittsfield Mills Mgr. Exeter Mills	Pittsfield, N. H.	Oct. 31, 1888.
Hervey Kent	Pres. Exeter Manufg. Co.	Exeter, N. H.	Apr. 20, 1865.
Nathaniel B. Kerr	Agt. Grinnell Manufg. Corp.	New Bedford, Mass.	Oct. 26, 1892.
John Kilburn		Belmont, Mass.	Apr. 20, 1865.
Harry W. Kimball	Supt. The Wm. A. Slater Mills Corp.,	Slatersville, R. I.	Oct. 24, 1895.
John M. Kimball	Agt. Slatersville Mills Special Atty. Jewett City Mills	4 Market Sq., Prov., R. I.	Oct. 31, 1888.
Benjamin B. Kirk	Supt. Shove Mills	2107 South Main St., Fall River, Mass.	Apr. 28, 1897.

Albert Knight	Supt. Quidnick Mills	Anthony, R. I.	Apr. 24, 1895.
Albert F. Knight		Quidnick, R. I.	Oct. 27, 1886.
Jesse A. Knight	Supt. Harris Manufg. Co.	Phenix, R. I.	Oct. 26, 1892.
Stephen A. Knight	Agt. Hebron Manufg. Co.	Box 820, Providence, R. I.	Oct. 21, 1868.
Walter B. Knight	Reynolds Manufg. Co.	Davisville, R. I.	Apr. 24, 1889.
Fred Lacey	Supt. Montreal Cotton Co.	Valleyfield, P. Q.	Apr. 24, 1895.
Wm. T. Lang	Agt. Brookside Mills	Knoxville, Tenn.	Apr. 28, 1897.
Walter H. Langshaw	Supt. Dartmouth Manufg. Corp.	New Bedford, Mass.	Apr. 29, 1896.
Elliott Cowdin Lambert	Supt. Amoskeag Manufg. Co.	Manchester, N. H.	Oct. 24, 1895.
George H. Law	Supt. Bristol Manufg. Corp.	64 Willis St., New Bedford, Mass.	Apr. 28, 1897.
Abbott F. Lawrence	Treas. Nemasket Mills	Box 125, Taunton, Mass.	Apr. 24, 1895.
Harold Lawton	Gen. Mgr. Warwick Mills	Centreville, R. I.	Oct. 27, 1886.
Evan Arthur Leigh	Textile Machinery	70 Kilby St., Boston, Mass.	Oct. 29, 1890.
J. Colby Lewis	W. A. Slater Mills	Jewett City, Ct.	Oct. 26, 1892.
Leontine Lincoln	Pres. Seaconnet Mills	Fall River, Mass.	Apr. 28, 1897.
Charles Warren Lippitt,	Treas. Silver Spring B. & D. Co.	Providence, R. I.	Oct. 30, 1878.
Henry F. Lippitt	Agt. Social and Manville Cos.	Providence, R. I.	Apr. 27, 1881.
Robert W. Lord	Agt. R. W. Lord & Co.	Kennebunk, Me.	Oct. 20, 1869.
Ernest Lovering	Agt. Lyman Mills	Holyoke, Mass.	Apr. 25, 1888.
Henry M. Lovering	Agt. Whittenton Manufg. Co.	Taunton, Mass.	Oct. 27, 1880.
William M. Lovering	Supt. Whittenton Manufg. Co.	Taunton, Mass.	Sept. 27, 1894.
Arthur H. Lowe	Treas. Parkhill Manufg. Co.	Fitchburg, Mass.	Oct. 30, 1889.
David Lowe	Asst. Supt. Parkhill Manufg. Co.	Fitchburg, Mass.	Apr. 24, 1895.
Dudley T. Lyall	Asst. Mgr. Brighton Mills	541 W. 23d St., N. Y.	Sept. 22, 1896.
William L. Lyall	Supt. J. & W. Lyall Loom and Machine Works	540 W. 23d St., New York City	Oct. 26, 1892.
Herbert Lyman	Treas. Hadley Co.	95 Milk St., Boston, Mass.	Oct. 24, 1895.
Otis G. Lynch	Supt. Enterprise Manufg. Co.	Augusta, Ga.	Oct. 24, 1895.
Alvin S. Lyon	Supt. Lowell Manufg. Co.	Lowell, Mass.	Apr. 26, 1882.
Jas. R. MacColl	Treas. Lorraine Manufg. Co.	Pawtucket, R. I.	Apr. 24, 1895.
Chas. L. Macomber	Agt. Nemasket Mills	Taunton, Mass.	Apr. 24, 1895.
Charles T. Main	Mech. and Mill Engineer	Exchange Bldg., Boston, Mass.	Oct. 28, 1885.
Charles R. Makepeace	Mill Engineer	Box 973, Providence, R. I.	Apr. 30, 1890.
Arthur B. Mann	J. H. Martin & Co.,	Box 465, 99 Franklin St., New York	Apr. 25, 1894.
Charles H. Manning	Gen. Supt. Amoskeag Manufg. Co.	Manchester, N. H.	Oct. 28, 1885.
Henry F. Mansfield	Gen. Supt. Utica Steam Cotton Mills and Mohawk Valley Cotton Mills	Utica, N. Y.	Apr. 30, 1890.
Albert G. Martin	Supt. Kincaid Manufg. Co.	Box 272, Griffin, Ga.	Apr. 30, 1884.
Henry D. Martin	Supt. Samson Cordage Works	Shirley, Mass.	Apr. 28, 1897.
Ira J. Martin	Supt. Bozrahville Co.	Bozrahville, Conn.	Oct. 26, 1892.
John R. Mason	Supt. Laurel Lake Mills	Fall River, Mass.	Apr. 28, 1897.
Philip A. Mathewson	Supt. King Philip Mills	Box 607, Fall River, Mass.	Apr. 24, 1895.
Thomas Mayor	Textile Machinery	26 Olney St., Providence, R. I.	Oct. 27, 1880.

Robert McArthur	Agt. Pepperell and Laconia Cos.	Biddeford, Me.	Apr. 17, 1872.
Charles D. McDuffie	Agt. Manchester Mills	Manchester, N. H.	Apr. 21, 1869.
Fred C. McDuffie	Treas. Everett Mills and York Manufg. Co.	Box 2963 Boston, Mass.	Oct. 25, 1882.
William G. McLoon	Supt. Barnaby Manufg. Co.	Fall River, Mass.	Apr. 27, 1892.
James H. McMullan	Agt. Saco Water Power Machine Co.	Biddeford, Me.	Apr. 21, 1869.
William P. McMullan	Agt. Naumkeag Steam Cotton Co.	Salem, Mass.	Sept. 27, 1894.
John Tempest Meats	Supt. Mason Machine Works	Taunton, Mass.	Apr. 27, 1887.
Charles H. Merriman, Jr.	Asst. Supt. Social & Nourse Mills	Woonsocket, R. I.	Apr. 24, 1895.
Frank M. Messenger	Agt. Grosvenor Dale Co.	No. Grosvenor Dale, Conn.	Apr. 27, 1887.
W. H. Miles	Agt. Farwell Mills	Lisbon, Me.	Sept. 22, 1896.
James I. Milliken	Agt. Everett Mills	Lawrence, Mass.	Oct. 26, 1892.
Roscoe S. Milliken	Supt. Pemberton Co.	Lawrence, Mass.	Apr. 29, 1896.
David Milne	C. J. Milne & Sons	Washington Ave. & 11th St., Philadelphia, Pa.	Apr. 28, 1897.
A. B. Mole	Mgr. Greylock Mill	Adams, Mass.	Apr. 24, 1895.
Edward A. Mongeon	Supt. Blackstone Manufg. Co.	Blackstone, Mass.	Apr. 24, 1895.
Fred W. Moore	Agt. Cordis Mills	Millbury, Mass.	Apr. 27, 1892.
George F. Morgan	Lowell Machine Shop	Lowell, Mass.	Oct. 28, 1891.
Albert H. Morton	Supt. Kitson Machine Co.	Lowell, Mass.	Oct. 28, 1891.
Fred S. Mosher	Supt. Henrietta Mills	Henrietta, Rutherford Co., N. C.	Oct. 24, 1895.
Oliver H. Moulton	Supt. Hamilton Manufg. Co.	Lowell, Mass.	Apr. 20, 1865.
Farquharson J. Muir	Supt. Canadian Col. Cot. Mills Co.	Hamilton, Ont., Can.	Apr. 27, 1892.
Wm. B. Munroe	Supt. Millville Manufg. Co.	Garwood, N. J.	Oct. 24, 1895.
Roscius C. Newell	Supt. Palmer Mill	Three Rivers, Mass.	Oct. 24, 1895.
William G. Nichols	Supt. Lancaster Mills	Clinton, Mass.	Oct. 25, 1893.
Franklin Nourse	Agt. Lawrence Manufg. Co.	Lowell, Mass.	Apr. 24, 1878.
Eben H. Nutting	Agt. Hooksett Mills	Hooksett, N. H.	Oct. 25, 1882.
S. Odenheimer	Treas. Lane Mills	New Orleans, La.	Oct. 25, 1893.
Charles K. Oliver	Treas. Columbia Mills Co.	Columbia, S. C.	Sept. 27, 1894.
Warren M. Orswell	Pres. Orswell and Nockege Mills	Fitchburg, Mass.	Apr. 16, 1873.
J. Edward Osborn	Treas. American Linen Co.	Fall River, Mass.	Apr. 28, 1897.
Oscar L. Owen	Mech. and Mill Eng. Whitin Machine Works	Whitinsville, Mass.	Apr. 25, 1894.
Elmer E. Page	Agt. York Manufg. Co.	Saco, Me.	Apr. 27, 1892.
Francis J. Parker	Treas. Monadnock Mills, 27 Kilby St.,	Boston, Mass.	Jan. 15, 1868.
O. B. Parker	Supt. U. S. Cotton Co.	Central Falls, R. I.	Apr. 24, 1895.
Samuel L. Parker	Supt. Turners Falls Cotton Mills	Box 627, Turners Falls, Mass.	Apr. 29, 1896.
Walter E. Parker	Agt. Pacific Mills	Lawrence, Mass.	Apr. 25, 1877.
John H. Parks	Pres. Wm. Parks & Son, Ltd.	St. John, N. B.	Apr. 24, 1878.
Duncan D. Parmly	Treas. JohnsonMfg. Co. and Dunbar Mills Co.	160 Broadway, New York, N. Y.	Sept. 22, 1896.

John W. Pead	Agt. Merrimack Manufg. Co.	Box 1231, Lowell, Mass.	Apr. 26, 1893.
James R. Pearce	Supt. Fulton Bag and Cotton Mills	68 So. Boulevard, Atlanta, Ga.	Oct. 24, 1895.
Wm. C. Peirce	Pres. Elizabeth Mills, 564 Eddy St.,	Providence, R. I.	Apr. 24, 1895.
William D. Pennell	Agt. Hill Manufg. Co.	Lewiston, Me.	Apr. 16, 1873.
Haven C. Perham	Treas. Kitson Machine Co.	Lowell, Mass.	Apr. 30, 1879.
Henry C. Phillips	Supt. H. N. Slater Mills	Webster, Mass.	Apr. 25, 1894.
Andrew G. Pierce, Jr.	Treas. Pierce Manufg. Corp.	New Bedford, Mass.	Apr. 24, 1895.
Moses Pierce	Pres. Aspinook Co.	274 Broadway, Norwich, Conn.	Oct. 30, 1878.
Reuben Pilling, Jr.	Supt. Granite Mills Co.	Greenville, R. I.	Apr. 29, 1896.
Charles H. Plummer	Agt. Great Falls Manufg. Co.	Somersworth, N. H.	Apr. 25, 1888.
Charles T. Plunkett	Sec. Berkshire Cotton Mfg. Co.	Adams, Mass.	Apr. 28, 1897.
Thomas C. Powell		1 Custom House St., Providence, R. I.	Oct. 30, 1889.
Herbert L. Pratt	Agt. Bates Manufg. Co.	Lewiston, Me.	Oct. 27, 1875.
T. W. Pratt	Pres. West Huntsville Cotton Mills Co.	Huntsville, Ala.	Sept. 22, 1896.
John E. Prest	Gen. Supt. Harmony Mills	Cohoes, N. Y.	Apr. 17, 1872.
M. W. Quinn	Agt. Hamilton Woolen Co.	Amesbury, Mass.	Oct. 27, 1886.
T. G. Ramsdell	Agt. Monument Mills	Housatonic, Mass.	Oct. 30, 1878.
M. A. Rawlinson	Supt. Tremont and Suffolk Mills	Lowell, Mass.	Apr. 24, 1895.
Robert Redford	Agt. Arlington Mills	Lawrence, Mass.	Apr. 26, 1882.
James Renfrew	Treas. Renfrew Manufg. Co.	Adams, Mass.	Oct. 18, 1871.
Roscoe C. Reynolds	Agt. Lewiston Machine Co.	Lewiston, Me.	Oct. 25, 1876.
F. H. Rice	Holbrook Mills	Box 47, W. Boylston, Mass.	Apr. 28, 1880.
Charles H. Richardson	Agt. Appleton Co.	Lowell, Mass.	Apr. 24, 1889.
C. T. Richmond	Man. Fustian Dept. Crompton Co.	Crompton, R. I.	Apr. 28, 1897.
C. W. Rider	Treas. Merrick Thread Co.	Holyoke, Mass.	Apr. 29, 1896.
Charles E. Riley	Textile Machinery	Box 2815 281 Congress St., Boston, Mass.	Apr. 25, 1888.
George W. Robbins	Supt. J. Edwin Smith Mill	Smithville, Mass.	Apr. 28, 1897.
Charles D. Robinson	Supt. Crompton Co.	Crompton, R. I.	Sept. 27, 1894.
William A. Robinson	Treas. Savannah Cotton Mills	Savannah, Ga.	Apr. 29, 1896.
John K. Russell	Gen. Mgr. May's Landing Water P. Co. and Millville Manufg. Co.	Millville, N. J.	Apr. 29, 1891.
Arnold B. Sanford	Agt. Sanford Spinning Co.	Fall River, Mass.	Oct. 25, 1882.
Charles Henry Savage	Supt. Manville Co.	Manville, R. I.	Apr. 26, 1893.
J. H. Sawyer	Treas. Newmarket Manufg. Co.	Box 2966, Boston, Mass.	July 19, 1865.
George H. Sayward	Mgr. Standard Yarn Co.	Oswego, N. Y.	Oct. 29, 1890.
Arnold Schaer	Supt. Warren Manufg. Co.	Warren, R. I.	Apr. 24, 1895.
John Scott	Supt. Willimantic Linen Co.	Willimantic, Conn.	Oct. 29, 1879.
George H. Shapley	Mgr. Silver Lake Co., 78 Chauncy St.,	Boston, Mass.	Apr. 29, 1896.

Frank P. Sheldon	Mill Engineer	Providence, R. I.	Apr. 25, 1894.
Thomas C. Sheldon	Agt. Fitchburg Duck Mills	Fitchburg, Mass.	Oct. 29, 1884.
Willis S. Shepard	Pres. American Net and Twine Co.	93 Commercial St., Boston, Mass.	Apr. 29, 1896.
George E. Sherman		Central Falls, R. I.	Apr. 27, 1881.
William F. Sherman	Agt. Atlantic Cotton Mills,	Box A, Lawrence, Mass.	Apr. 15, 1874.
Charles M. Shove	Treas. Granite Mills	Box 45, Fall River, Mass.	Oct. 27, 1875.
Herbert H Shumway	Treas. Corr Manufg. Co.	Taunton, Mass.	Apr. 26, 1893.
Francis H. Silsbee	Supt. Cotton Dept. Pacific Mills	Lawrence, Mass.	Apr. 27, 1887.
Louis Simpson	Gen. Mgr. Montreal Cotton Co.	Valleyfield, P. Q.	Apr. 24, 1895.
Abbott E. Slade	Treas. Laurel Lake Mills	Fall River, Mass.	Oct. 25, 1893.
Arba C. Slater	Supt. Linwood Mills	Whitinsville, Mass.	Jan. 15, 1868.
Arthur T. Smith	Supt. Langley Manufg Co.	Langley, S. C.	Oct. 24, 1895.
Joel Smith	Supt. The J. P. King Manufg. Co. Supt. Aiken Manufg. Co.	Augusta, Ga. Bath, S. C.	Oct. 24, 1895.
Robert R. Smith	Mgr. Greenwoods Co.	New Hartford, Conn.	Oct. 19, 1870.
William O. Smith	Agt. Easthampton Spinning Co.	Easthampton, Mass.	Apr. 28, 1897.
Ellison A. Smyth		Greenville, S. C.	Oct. 26, 1892.
Wm. S. Southworth	Agt. Mass. Cotton Mills	Lowell, Mass.	Oct. 31, 1888.
William T. Spear	Supt. Jackson Co.	Nashua, N. H.	Oct. 30, 1889.
S. S. Spencer	Supt. Conestogo Steam Mills	Lancaster, Pa.	Oct. 25, 1876.
George E. Spofford	Supt. Readville Cotton Mills	Readville, Mass.	Apr. 29, 1896.
Leroy Springs	Pres. Lancaster Cotton Mills	Lancaster, S. C.	Oct. 24, 1895.
George R. Stearns	Pres. Riverside Mills	Augusta, Ga.	Apr. 30, 1890.
Walter F. Stiles	Treas. Nockege & Orswell Mills	Fitchburg, Mass.	Oct. 24, 1895.
O. W. Stites	Supt. No. Pownal Manufg. Co.	No. Pownal, Vt.	Oct. 24, 1895.
Herman F. Straw	Agt. Amoskeag Manufg. Co.	Manchester, N. H.	Oct. 28, 1885.
Walter H. Summersby	Supt. Pontiac Mill and Bleachery	Pontiac, R. I.	Oct. 25, 1893.
Albert A. Sweet	Supt. King Philip Mills	969 Charles St., Fall River, Mass.	Apr. 26, 1893.
James O. Sweet	Agt. and Treas. Ashland Cotton Co.	Jewett City, Conn.	Apr. 28, 1886.
Edward P. Taft	Treas. Ponemah Mills	Box 1443, Providence, R. I.	Oct. 28, 1885.
Robert Rennie Taft	Supt. Baltic Power Co.	Baltic, Conn.	Apr. 24, 1895.
Robert W. Taft	Asst. Treas. Bernon Mills Treas. Coventry Co.	Box 1144, Providence, R. I.	Sept. 27, 1894.
George P. Taylor	Agt. Lancaster Mills	Clinton, Mass.	Oct. 27, 1880.
James W. Taylor	Supt. Canoe River Mills	Box 46, Taunton, Mass.	Oct. 26, 1892.
W. Marshall Taylor	Supt. Cotton Mill, The Wm. Clark Thread Co.	69 Mechanic St., Westerly, R. I.	Sept. 22, 1896.
Richard Thackeray	Supt. Weetamoe Mills	Fall River, Mass.	Apr. 29, 1885.
Earl A. Thissell	Amasa Pratt & Co.	Lowell, Mass.	Oct. 30, 1878.
Ariel C. Thomas	Supt. Clinton Manufg. Co.	93 Clinton St., Woonsocket, R. I.	Oct. 31, 1888.
Charles E. Thomas	Treas. Forestdale Manufg. Co.	Woonsocket, R. I.	Oct. 31, 1883.
Edward W. Thomas	Agt. Tremont and Suffolk Mills	Lowell, Mass.	Apr. 30, 1884.
Ralph E. Thompson	Supt. Parkhill Manufg. Co.	Fitchburg, Mass.	Apr. 25, 1894.

D. M. Thompson	Pres. & Treas. Corliss Steam Engine Co.	Providence, R. I.	Oct. 28, 1885.
Osmon B. Tilton	Tremont and Suffolk Mills	Lowell, Mass.	Oct. 27, 1886.
James P. Tolman	Pres. Samson Cordage Works	115 Congress St., Boston, Mass.	Oct. 29, 1890.
D. A. Tompkins	Pres. Atherton Mills	Charlotte, N. C.	Oct. 24, 1895.
George W. Towne	Supt. Cotton Dept. Arlington Mills	Lawrence, Mass.	Oct. 26, 1892.
William E. Trainer	Pres. Linwood Mills	Trainer, Penn.	Apr. 21, 1875.
Robert B. Treat	Centerville Cotton Mills	Centerville, R. I.	Sept. 27, 1894.
C. H. Truesdell	Supt. Attawaugan Co.	Killingly, Conn.	Oct. 29, 1884.
Edmund E. Truesdell	Supt. China, Webs'r & Pemb'ke Mills	Suncook, N. H.	Apr. 26, 1876.
Oscar B. Truesdell	Agt. Fiskdale Mills	Fiskdale, Mass.	Oct. 15, 1873.
George F. Tryon	Supt. Conanicut Mills	Fall River, Mass.	Apr. 28, 1897.
George E. Tucker	Agt. Otis Co.	Ware, Mass.	Oct. 24, 1895.
William D. Twiss	Supt. Everett Mills	Lawrence, Mass.	April 29, 1896.
Charles T. Upton	Supt. Lowell Hosiery Co.	Lowell, Mass.	Apr. 28, 1897.
George A. Vaughan	Supt. Putnam Manufg. Co.	Putnam, Conn.	Sept. 22, 1896.
Frank P. Vogl	Agt. Monadnock Mills	Claremont, N. H.	Sept. 27, 1894.
Jude C. Wadleigh	Supt. Mass. Cotton Mills	Lowell, Mass.	Oct. 26, 1892.
Herbert E. Walmesley	Wamsutta Mills	New Bedford, Mass.	Oct. 29, 1890.
Frederick T. Walsh	Agt. Lowell Bleachery & Dye Works,	Lowell, Mass.	Apr. 28, 1897.
James A. Walsh	Agt. Lewiston Bleachery and Dye Works	Lewiston, Me.	Apr. 27, 1892.
Arthur W. Warren	Treas. W. Warren Thread Works	Westfield, Mass.	Apr. 29, 1896.
John Waterman	Treas. Warren Manufg. Co.	Warren, R. I.	Apr. 30, 1884.
Joseph W. Wattles	Manufacturers' Supplies	Canton Junction, Mass.	July 18, 1866.
T. B. Wattles	Mangr. Boscawen Mills	Penacook, N. H.	July 18, 1866.
George W. Weeks		Clinton, Mass.	Apr. 21, 1869.
W. B. Smith Whaley	Pres. Richland Cotton Mills Granly Cotton Mills, 1328 Main St.	Columbia, S. C.	Apr. 24, 1895.
H. D. Wheat	Treas. & Gen. Mgr. Gaffney Mfg. Co.,	Gaffney, S. C.	Apr. 24, 1895.
Channing Whitaker	Questions of Infringement and Patent-ability, Lowell Machine Shop	Lowell, Mass.	Oct. 15, 1873.
A. Tenny White	Supt. Globe Mill	Woonsocket, R. I.	Oct. 26, 1887.
Z. L. White	White Bros.	Winchendon Springs, Mass.	Apr. 28, 1897.
Arthur F. Whitin	Treas. Whitinsville Cotton Mills	Whitinsville, Mass.	Apr. 24, 1895.
Fred B. Whitin	Supt. Uxbridge Cotton Mills	No. Uxbridge, Mass.	Apr. 28, 1897.
Henry T. Whitin	Treas Paul Whitin Manufg. Co.	Northbridge, Mass.	Apr. 25, 1877.
Alfred N. Whiting	Sec'y and Treas. L. M. Harris Manufg. Co.	Oakdale, Mass.	Apr. 21, 1875.
William S. Whitney	Supt. Mech. Depts., Wash. Mills Co.,	Lawrence, Mass.	Apr. 24, 1878.
William Whittam, Jr.	Clark Mile End Spool Cotton Co.	319 Summer Ave., Newark, N. J.	Apr. 26, 1893.

George F. Whitten	Agt. Amory Mfg. Co.	Manchester, N. H.	Oct. 26, 1892.
Edward B. Wilbur	Supt. Newberry Cotton Mills	Newberry, S. C.	Oct. 30, 1889.
Henry M. Wilcox	Treas. John Rhodes Warp Co.	Millbury, Mass.	Apr. 24, 1889.
Eben C. Willey	Supt. Manchaug Company	Manchaug, Mass.	Apr. 29, 1896.
Theop. W. Wilmarth	Supt. Millbury Cotton Mills	Millbury, Mass.	Oct. 31, 1883.
Thomas Wilmarth	Supt. Saunders Cotton Mills	Saundersville, Mass.	Apr. 21, 1875.
J. P. Wilson	Treas. Dover Cotton Mills	Pineville, N. C.	Oct. 24, 1895.
A. S. Winslow	Agt. Peabody Mills	Newburyport, Mass.	Oct. 31, 1888.
George Wood	Pres. and Treas. Millville Manufg. Co.	626 Chestnut St., Phila., Pa.	Oct. 16, 1872.
John P. Wood	William Wood & Co.	521 North 22d St. Philadelphia, Pa.	Apr. 28, 1897.
C. J. H. Woodbury	Secy. and Treas.	Lynn, Mass.	Oct. 29, 1879.
Alvin Woodman	32 Wilder St.	Brockton, Mass.	Apr. 26, 1893.
A. A. Young, Jr.	Treas. Jewett City Mills	Jewett City, Conn.	Sept. 27, 1894.
Adelbert R. Young	Supt. Ashland Cotton Co.	Jewett City, Conn.	Apr. 25, 1894.

ASSOCIATE MEMBERS.

Henry Ashworth	Card Clothing Manufacturer	Fall River, Mass.	Apr. 28, 1897.
Geo. R. Babbitt	Pres. American Oil Co.	182 So. Water St., Providence, R. I.	Apr. 24, 1895.
D. C. Ball	The American Cotton Co.	109 Walnut St., St. Louis, Mo.	Oct. 24, 1895.
Geo. S. Barnum	Secy. and Treas. The Bigelow Co.	New Haven, Conn.	Apr. 24, 1895.
Colin C. Bell	Pres. and Treas. Laminar Fibre Co.	No. Cambridge, Mass.	Apr. 29, 1896.
Frank P. Bennett	Pub. Amer. Wool and Cot. Reporter	148 Pearl St., Boston, Mass.	Sept. 22, 1896.
Geo. W. Benson	Dealer in Cotton Waste. A. Emerson & Co.	36 Purchase St., Boston, Mass.	Apr. 24, 1895.
William H. Bent	Treas. Mason Machine Works	Taunton, Mass.	Apr. 29, 1896.
W. T. Bessonette	Inventor of Cylindrical Bale	Temple, Texas.	Apr. 29, 1896.
J. Payson Bradley	The Kehew-Bradley Co.	24 Purchase St., Boston, Mass.	Apr. 24, 1895.
J. Frank Braids	Mgr. Grease & Oil Dept., Charles S. Bush Co.	212 Weybosset St., Providence, R. I.	Apr. 28, 1897.
Henry G. Brinckerhoff	N. E. Mgr. Fuel Economizer Co.	Room 321, 53 State St., Boston, Mass.	Sept. 22, 1896.
D. Russell Brown	Pres. Brown Bros. Co.	Providence, R. I.	Apr. 24, 1895.
H. Martin Brown	Brown Bros. Co.	Providence, R. I.	Apr. 24, 1895.
John H. Burghardt	Mill Supplies	31 Pearl St., Boston, Mass.	Apr. 24, 1895.
Eugene E. Burnham	Belt Mfr.	168 Broadway, Lawrence, Mass.	Oct. 24, 1895.
James Butterworth	Pres. H. W. Butterworth & Sons Co.	York and Cedar Sts., Philadelphia, Pa.	Apr. 24, 1895.

Malcolm Campbell . . Gen. Mgr. Woonsocket Machine and Press Co. . . . . .
. . . . . Woonsocket, R. I. . . Apr. 24, 1895.
W. W. Carey . . . . . Wood Rim Pulley Mfr. . . . . Lowell, Mass. . . . . Apr. 24, 1895.
Fred A. Chase . . . . Mill Supplies, F. A. Chase & Co. . . Providence, R. I. . . Apr. 24, 1895.
Chas. H. Child . . . . Treas. Brown Bros. Co. . Box 890, Providence, R. I. . . Apr. 24, 1895.
Peter H. Corr . . . . Cotton and Cotton Yarns . . . . . Taunton, Mass. . . . Apr. 24, 1895.
Thos. G. Cox . . . . . Selling Agt. Mason Mach. Works . . . . . .
. . . . . Box 316, . Taunton, Mass. . . . Apr. 24, 1895.

Frederick I. Dana . . . Mech. Eng. Thomas Phillips Co. . . Providence, R. I. . . Apr. 24, 1895.
J. F. Dickinson . . . . Treas. South Belting Co. . . . . Atlanta, Ga. . . . . Apr. 29, 1896.
R. H. Deming . . . . Cotton Broker . 10 So. Water St., Providence, R. I. . . Apr. 24, 1895.
C. E. W. Dow . . . . Mgr. American Bolt Co. . . . . Lowell, Mass. . . . Apr. 24, 1895.

G. B. Emmons . . . . Pres. Emmons Loom Harness Co. . . . . .
. . . . . Box 203, Lawrence, Mass. . . Oct. 24, 1895.
T. C. Entwistle . . . . Cotton Machinery Manufacturer . . Lowell, Mass. . . . . Apr. 24, 1895.

D. D. Felton . . . . . Treas. S. A. Felton & Sons Co. . . . Manchester, N. H. . Apr. 24, 1895.
John W. Ferguson . . General Contractor . . . . . Paterson, N. J. . . . Apr. 24, 1895.
J. Herbert Foster . . . Cotton Broker . . . . . Providence, R. I. . . Apr. 24, 1895.
Geo. A. Fuller . . . . Mgr. Amer. Card Clothing Co. . . . Providence, R. I. . . Apr. 24, 1895.
John T. Fyans . . . . Agt. Fyans, Frazer & Blackway . . . . . .
. . . . . 411 Black St., Fall River, Mass. . . Apr. 28, 1897.

H. P. Garland . . . . Treas. Loom Picker Co. . . . . Biddeford, Me. . . . Oct. 24, 1895.
Royal W. Gates . . . . Josiah Gates & Sons, Belting . . . . . .
. . . . . 137 Market St., Lowell, Mass. . . . Apr. 24, 1895.
Rufus B. Goff . . . . Pres. Standard Mill Supply Co. . . . . .
. . . . . 77 Exchange Pl., Box 714, Providence, R. I. . . Apr. 28, 1897.
William S. Granger . . Prest. Granger Foundry & Machine Co., Providence, R. I. . Apr. 24, 1895.

William L. Haines . . Agt. for Brooks & Doxey, of Manchester, Eng. . . . .
. . . . . 161 Pearl St., Boston, Mass. . . . Apr. 29, 1896.
A. Walter Harris . . . Treas. A. W. Harris Oil Co. . . . . .
. . . . . 326 So. Water St., Providence, R. I. . . Oct. 24, 1895.
John H. Haworth . . . Haworth & Watson Mfrs. Paper Tubes . . . . . .
. . . . . for Textile Manufg. Columbus Av., Lowell, Mass. . . . Oct. 24, 1895.
Jerome Hill . . . . . Pres. Jerome Hill Cotton Co. . . . . .
. . . . . 116 South Main St., St. Louis, Mo. . . . Apr. 29, 1896.
Henry A. Holcomb . . Treas. New Bedford Boiler Co. . . New Bedford, Mass. . Oct. 24, 1895.
Henry S. Houghton, Sr., Mfr. Grid Bars and Beaters for Cotton Pickers . . . . .
. . . . . 65 Port St., Woonsocket, R. I. . Apr. 28, 1897.
C. H. Hutchins . . . . Pres. Crompton & Knowles Loom Works . . . . . .
. . . . . Worcester, Mass. . . Oct. 24, 1895.

David Jackson . . . . Pres. & Mgr. Jackson Pat. Shell Roll Co. . Pawtucket, R. I. Apr. 24, 1895.

Wm. B. Kehew . . . . The Kehew-Bradley Co. . 24 Purchase St., Boston, Mass. . Apr. 24, 1895.

Josiah M. Lasell . . . Asst. Treas. Whitin Machine Works, Whitinsville, Mass. . Apr. 24, 1895.
Stephen C. Lowe . . . Mill Supplies . . . . 87 Union St., New Bedford, Mass. . Oct. 24, 1895.

F. H. Maynard . . . . Bus. Mgr. Gen. Fire Extinguisher Co., Providence, R. I. . . Apr. 24, 1895.
H. G. McKerrow . . . Textile Machinery . . 31 State St., Boston, Mass. . . . Sept. 22, 1896.
Geo. H. Meader . . . Steam Appliances . . . . 35 Oliver St., Boston, Mass. . Apr. 24, 1895.
Geo. B. Morison . . . Selling Agt. Hadley Co. 95 Milk St., Boston, Mass. . . . Apr. 24, 1895.

Sidney B. Paine . . . Electrical Engineer . . 180 Summer St., Boston, Mass. . Apr. 24, 1895.
Arthur Parkinson . . . Selling Agt. The Arabol Mfg. Co. . . . . 13 Gold St., New York City . . . Apr. 28, 1897.
Stephen Minot Pitman . Sec'y Narragansett Fire Ins. Co., Box 315, Providence, R. I. Apr. 24, 1895.
Vladimir P. Polevoy . { Pur. Agt. Great Jaroslarvkaia Mfg. Co. (of Jaroslave), Russia . . . } 120 Broadway, N. Y. Apr. 28, 1897.
Charles A. M. Praray . of C. R. Makepeace & Co., Mill Architect and Engineer . . . . . Providence, R. I. . . Apr. 28, 1897.

Charles F. Randall . . Expert in Textiles . . . . . Room 350, Tremont Building, Boston, Mass. . . . Apr. 24, 1895.
Richard H. Rice . . . Treas. Rice & Sargent Steam Eng. Co. . . . . 40 Codding St., Providence, R. I. . . Apr. 24, 1895.
C. E. Roberts . . . . Mgr. Hartford Steam Boiler Ins. & Insp. Co. . . . . 125 Milk St., Boston, Mass. . Apr. 24, 1895.
John M. Russell . . . Asst. Treas. Crompton & Knowles Loom Works . . . . . Worcester, Mass. . . Oct. 24, 1895.

E. A. Smith . . . . . Pres. Charlotte Supply Co. . . . . Charlotte, N. C. . . . Oct. 24, 1895.
Harry M. Smith . . . Vice-Pres. Standard Mill Supply Co. . . . . 77 Exchange Pl., Box 714, Providence, R. I. . . Apr. 28, 1897.
R. P. Snelling . . . . Treas. Pettee Machine Works . Newton Upper Falls, Mass. Sept. 22, 1896.
Lewis R. Speare . . . Alden Speare Sons & Co., Oil and Mill Supplies . . . . . 369 Atlantic Ave., Boston, Mass. . Oct. 24, 1895.
Henry C. Spence . . . Gen. Mgr. Metallic Drawing Roll Co. Indian Orchard, Mass. Apr. 24, 1895.
Geo. W. Stafford . . . Mgr. Knowles Loom Works . . . . Providence, R. I. . . Apr. 24, 1895.
William H. Stratton . . Asst. Mgr. Factory Insurance Asso. . . . . 95 Pearl St., Hartford, Conn. . . Apr. 28, 1897.
Daniel J. Sully . . . . Cotton Broker . . . . . Providence, R. I. . . Apr. 24, 1895.

Cyrus A. Taft . . . . Agt. Whitin Machine Works . . . Whitinsville, Mass. . Apr. 24, 1895.
Winthrop Thayer . . . Pres. Thayer Co., 1015 Tremont Bldg., Boston, Mass. . . Apr. 29, 1896.

A. Curtis Tingley . . . Treas. Nat. Ring Traveler Co. . . . Providence, R. I. . . Sept. 22, 1896.
Wm. V. Threlfall . . . Selling Agt. Pettee Machine Works . . . . . Newton Upper Falls, Mass. . Apr. 24, 1895.

Frank H. Underwood . Mgr. Dodge Mfg. Co., 137 Purchase St., Boston, Mass. . . Apr. 29, 1896.

Justin A. Ware . . . . Sales Mgr. Crompton & Knowles Loom Works . . . . . Worcester, Mass. . . Oct. 24, 1895.
Walter S. Watson . . . Haworth & Watson Mfrs. Paper Tubes . . . . . for Textile Manufg. . Box 996, Lowell, Mass. . . . Oct. 24, 1895.
Wm. R. West . . . . Roll Coverer . . 830 Purchase St., New Bedford, Mass. . Sept. 22, 1896.
G. Marston Whitin . . Treas. Whitin Machine Works . . . Whitinsville, Mass. . Apr. 24, 1895.
Fred A. Wilde . . . . Asst. Mgr. The A. T. Atherton Mach. Co. . . . . Pawtucket, R. I. . . Apr. 28, 1897.
Erving Yale Woolley . Stoddard, Haserick, Richards & Co. . . . . 152 Congress St., Boston, Mass. . . Apr. 24, 1895.

Honorary Members	3
Active Members	411
Associate Members	81
Total Membership	495

MEMBERS OF THE ASSOCIATION,

May 1, 1897.

ARRANGED BY STATES.

MAINE.

Auburn	William Hayes	Barker Mill.
Biddeford	James G. Garland	
Biddeford	H. P. Garland	Loom Picker Co.
Biddeford	Robert McArthur	Pepperell & Laconia Cos.
Biddeford	Jas. H. McMullan	Saco Water Power Machine Co.
Brunswick	Russell W. Eaton	Cabot Manufg. Co.
Kennebunk	Robert W. Lord	R. W. Lord & Co.
Lewiston	A. D. Barker	Avon Manufg. Co.
Lewiston	George W. Bean	Androscoggin Mills.
Lewiston	H. B. Estes	Continental Mills.
Lewiston	William D. Pennell	Hill Manufg. Co.
Lewiston	Herbert L. Pratt	Bates Manufg. Co.
Lewiston	Roscoe C. Reynolds	Lewiston Machine Co.
Lewiston	James A. Walsh	Lewiston Bleachery and Dye Works.
Lisbon	W. H. Miles	Farwell Mills.
Old Orchard	John Gegenheimer	
Saco	Elmer E. Page	York Manufg. Co.
Waterville	Stephen I. Abbott	Lockwood Co.
Westbrook	Woodbury K. Dana	Dana Warp Mills.

NEW HAMPSHIRE.

Charlestown	Samuel Webber	Hydraulic Engineer.
Claremont	Frank P. Vogl	Monadnock Mills.
Dover	John Drowne	Cocheco Manufg. Co.
Dover	Charles H. Fish	Cocheco Manufg. Co.
Dover	John Holland	12 Trackey St.

Exeter	Hervey Kent	Exeter Manufg. Co.
Greenville	Frederick W. Ely	Columbian Manufg. Co.
Hooksett	Eben H. Nutting	Hooksett Mills.
Manchester	Stephen N. Bourne	Stark Mills.
Manchester	George A. Clark	Manchester Mills.
Manchester	D. D. Felton	S. A. Felton & Sons Co.
Manchester	Elliott Cowdin Lambert	Amoskeag Manufg. Co.
Manchester	Charles H. Manning	Amoskeag Manufg. Co.
Manchester	Charles D. McDuffie	Manchester Mills.
Manchester	Herman F. Straw	Amoskeag Manufg. Co.
Manchester	George F. Whitten	Amory Manufg. Co.
Milford	M. F. Foster	
Milford	Frank E. Kaley	Morse & Kaley Manufg. Co.
Nashua	William D. Cadwell	Nashua Manufg. Co.
Nashua	William T. Spear	Jackson Co.
Penacook	T. B. Wattles	Boscawen Mills.
Pittsfield	George E. Kent	Pittsfield and Exeter Mills.
Salmon Falls	O. S. Brown	Salmon Falls Manufg. Co.
Somersworth	Charles H. Plummer	Great Falls Manufg. Co.
Suncook	David L. Jewell	China, Webster & Pembroke Mills.
Suncook	Edmund E. Truesdell	China, Webster & Pembroke Mills.

VERMONT.

Burlington	John H. Hines	Queen City Cotton Co.
No. Pownal	O. W. Stites	No. Pownal Manufg. Co.

MASSACHUSETTS.

Adams	John S. Adams, Jr.	Adams Bros. Manufg. Co.
Adams	Z. D. Hall	Berkshire Cotton Manufg. Co.
Adams	A. B. Mole	Greylock Mill.
Adams	Charles T. Plunkett	Berkshire Cotton Manufg. Co.
Adams	James Renfrew	Renfrew Manufg. Co.
Amesbury	M. W. Quinn	Hamilton Woolen Co.
Belmont	John Kilburn	
Blackstone	Edward A. Mongeon	Blackstone Manufg. Co.
Bondsville	Elmer G. Childs	Boston Duck Co.
Bondsville	Wm. E. Hall	Boston Duck Co.
Boston	Charles B. Amory	Hamilton Manufg. Co.
Boston	Edward Atkinson	Boston Mfrs. Mut. Fire Ins. Co.
Boston	Edward W. Atkinson	Stoddard, Haserick, Richards Co.
Boston	Joseph P. Battles	65 Equitable Building.
Boston	Frank P. Bennett	American Wool & Cotton Reporter.
Boston	Geo. W. Benson	A. Emerson & Co.

Boston	J. Payson Bradley	The Kehew-Bradley Co.
Boston	Henry G. Brinckerhoff	Fuel Economizer Co.
Boston	John H. Burkhardt	Mill Supplies.
Boston	Alphonse S. Covel	Tremont & Suffolk Mills.
Boston	Ambrose Eastman	53 State St.
Boston	William Firth	American Drosophore Co.
Boston	Alfred M. Goodale	Boston Manufg. Co.
Boston	Stephen Greene	Mill Engineer.
Boston	William L. Haines	Brooks & Doxey, Manchester, Eng.
Boston	Henry S. Howe	Lawrence & Co.
Boston	William B. Kehew	The Kehew-Bradley Co.
Boston	Evan Arthur Leigh	Textile Machinery.
Boston	Herbert Lyman	Hadley Co.
Boston	Charles T. Main	Mech. Mill Engineer.
Boston	Fred C. McDuffie	Everett Mills & York Manufg. Co.
Boston	H. G. McKerrow	Textile Machinery.
Boston	George H. Meader	Steam Appliances.
Boston	George B. Morison	Hadley Co.
Boston	Sidney B. Paine	General Electric Co.
Boston	Francis J. Parker	Monadnock Mills.
Boston	Charles F. Randall	Expert in Textiles.
Boston	Charles E. Riley	Textile Machinery.
Boston	C. E. Roberts	Hartford St. Boiler Ins. & Insp. Co.
Boston	J. H. Sawyer	Newmarket Manufg. Co.
Boston	Geo. H. Shapley	Silver Lake Co.
Boston	Willis S. Shepard	Am. Net & Twine Co.
Boston	Lewis R. Speare	Alden Speare Sons & Co.
Boston	Winthrop Thayer	Thayer Co.
Boston	James P. Tolman	Samson Cordage Works.
Boston	Frank H. Underwood	Dodge Manufg. Co.
Boston	Erving Yale Woolley	Stoddard, Haserick, Richards Co.
Brockton	Alvin Woodman	32 Wilder St.
Canton Junction	Joseph W. Wattles	Manufacturers' Supplies.
Chicopee Falls	Henry A. Bailey	Chicopee Manufg. Co.
Clinton	William G. Nichols	Lancaster Mills.
Clinton	George P. Taylor	Lancaster Mills.
Clinton	George W. Weeks	
Easthampton	Wm. O. Smith	Easthampton Spinning Co.
Fall River	F. S. Akin	Cornell Mills.
Fall River	Henry Ashworth	Card Clothing Manufr.
Fall River	Nathaniel B. Borden	Barnard Manufg. Co.
Fall River	Richard B. Borden	Troy C. & W. Manufg. Co.
Fall River	Thomas J. Borden	Richard Borden Manufg. Co.
Fall River	George A. Chace	Bourne Mills.
Fall River	Simeon B. Chase	King Phillip Mills.
Fall River	John A. Collins	American Linen Co.
Fall River	B. D. Davol	Barnard Manufg. Co.

Fall River	David H. Dyer	Mill Engineer.
Fall River	William Evans	Richard Borden Manufg. Co.
Fall River	John T. Fyans	Fyans, Frazer & Blackway.
Fall River	Daniel Gilligan	Pocasset & Metacomet Mills.
Fall River	John Gregson	Merchants Mfg. Co.
Fall River	A. M. Hamilton	Parker Mills.
Fall River	John F. Hamlet	P. O. Box 160.
Fall River	Samuel E. Hathaway	Fall River Iron Works.
Fall River	William Hathaway	Barnard Mfg. Co.
Fall River	William B. Hawes	North Dighton Cotton Co.
Fall River	George H. Hills	Davol Mills.
Fall River	Benj. B. Kirk	Shove Mills.
Fall River	Leontine Lincoln	Seaconnet Mills.
Fall River	John R. Mason	Laurel Lake Mills.
Fall River	Philip A. Mathewson	King Philip Mills.
Fall River	Wm. G. McLoon	Barnaby Manufg. Co.
Fall River	J. Edward Osborne	American Linen Co.
Fall River	Arnold B. Sanford	Sanford Spinning Co.
Fall River	Charles M. Shove	Granite Mills.
Fall River	Abbott E. Slade	Laurel Lake Mills.
Fall River	Albert A. Sweet	King Philip Mills.
Fall River	Richard Thackeray	Weetamoe Mills.
Fall River	Geo. F. Tryon	Conanicut Mills.
Fiskdale	Oscar B. Truesdell	Fiskdale Mills.
Fitchburg	George P. Grant, Jr.	Grant Yarn Co.
Fitchburg	W. E. Keach	Grant Yarn Mills.
Fitchburg	Arthur H. Lowe	Parkhill Manufg Co.
Fitchburg	David Lowe	Parkhill Manufg. Co.
Fitchburg	Warren M. Orswell	Orswell and Nockedge Mills.
Fitchburg	Thomas C. Sheldon	Fitchburg Duck Mills.
Fitchburg	Walter F. Stiles	Nockedge & Orswell Mills.
Fitchburg	Ralph E. Thomspon	Parkhill Manufg. Co.
Great Barrington	Jno. H. C. Church	Monument Mills.
Griswoldville	James C. Deane	Griswoldville Manufg. Co.
Holyoke	Joseph M. Dunham	Merrick Thread Co.
Holyoke	Ernest Lovering	Lyman Mills.
Holyoke	C. W. Rider	Merrick Thread Co.
Hopedale	Eben S. Draper	Draper Co.
Hopedale	George A. Draper	Draper Co.
Hopedale	George Otis Draper	Draper Co.
Hopedale	William F. Draper	Draper Co.
Hopedale	William F. Draper, Jr.	Draper Co.
Housatonic	T. G. Ramsdell	Monument Mills.
Indian Orchard	William C. Godfrey	Indian Orchard Co.
Indian Orchard	Charles J. Goodwin	Indian Orchard Co.
Indian Orchard	Henry C. Spence	Metallic Drawing Roll Co.

Lawrence	Wm. A. Barrell	Lawrence Duck Co.
Lawrence	Eugene E. Burnham	Leather Belt Man'fr.
Lawrence	Fred E. Clarke	Pemberton Co. and Methuen Co.
Lawrence	Albert W. Dimick	Atlantic Cotton Mills.
Lawrence	G. B. Emmons	Emmons Loom Harness Co.
Lawrence	James I. Milliken	Everett Mills.
Lawrence	Roscoe S. Milliken	Pemberton Co.
Lawrence	Walter E. Parker	Pacific Mills.
Lawrence	Robert Redford	Arlington Mills.
Lawrence	William F. Sherman	Atlantic Cotton Mills.
Lawrence	Francis H. Silsbee	Pacific Mills.
Lawrence	George W. Towne	Arlington Mills.
Lawrence	William D. Twiss	Everett Mills.
Lawrence	William S. Whitney	Washington Mills Co.
Leicester	Chas. A. Denny	American Card Clothing Co.
Lowell	George E. Ames	Lawrence Manufg. Co.
Lowell	Frank A. Bowen	Appleton Co.
Lowell	Christopher P. Brooks	Lowell Textile School.
Lowell	Edward N. Burke	Lowell Machine Shop.
Lowell	W. W. Carey	Wood Rim Pulley Manufacturer.
Lowell	Clarence N. Childs	Hamilton Manufg. Co.
Lowell	Jeremiah Clark	Textile Machinery.
Lowell	Alfred Clarke	Eastern Elec. Light & Stor. Bat. Co
Lowell	Alonzo A. Coburn	Atherton Machine Co.
Lowell	A. G. Cumnock	Boott Cotton Mills.
Lowell	Albert W. Danforth	881 Bridge St.
Lowell	Edward P. Dennis	Lowell Machine Shop.
Lowell	C. E. W. Dow	American Bolt Co.
Lowell	William A. Eastman	Lowell Hosiery Co.
Lowell	T. C. Entwistle	Manfr. Cotton Machinery.
Lowell	Frederick A. Flather	Lowell Machine Shop.
Lowell	Royal W. Gates	Josiah Gates & Sons.
Lowell	John J. Hart	Merrimac Print Works.
Lowell	John H. Haworth	Haworth & Watson Manufg. Co.
Lowell	James G. Hill	Lawrence Manufg. Co.
Lowell	George L. Hooper	Shaw Stocking Co.
Lowell	Alvin S. Lyon	Lowell Manufg. Co.
Lowell	Geo. F. Morgan	Lowell Machine Shop.
Lowell	Albert H. Morton	Kitson Machine Co.
Lowell	Oliver H. Moulton	Hamilton Manufg. Co.
Lowell	Franklin Nourse	Lawrence Manufg. Co.
Lowell	John W. Pead	Merrimac Manufg. Co.
Lowell	Haven C. Perham	Kitson Machine Co.
Lowell	M. A. Rawlinson	Tremont & Suffolk Mills.
Lowell	Charles H. Richardson	Appleton Co.
Lowell	Wm. S. Southworth	Mass. Cotton Mills.

Lowell	Earl A. Thissell	Amasa Pratt & Co.
Lowell	Osmon B. Tilton	Tremont & Suffolk Mills.
Lowell	Edward W. Thomas	Tremont and Suffolk Mills.
Lowell	Chas. T. Upton	Lowell Hosiery Co.
Lowell	Jude C. Wadleigh	Mass. Cotton Mills.
Lowell	Frederick T. Walsh	Lowell Bleachery & Dye Works.
Lowell	Walter S. Watson	Haworth & Watson Manufg. Co.
Lowell	Channing Whitaker	Lowell Machine Shop.
Lynn	C. J. H. Woodbury	Secy. and Treas.
Manchaug	Eben C. Willey	Manchaug Co.
Methuen	Lewis E. Barnes	Methuen Co.
Millbury	Fred W. Moore	Cordis Mills.
Millbury	Henry M. Wilcox	John Rhodes Warp Co.
Millbury	Theop. W. Wilmarth	Millbury Cotton Mills.
New Bedford	George A. Ayer	City Manufg. Corp.
New Bedford	Robert Burgess	Pierce Manufg. Corp.
New Bedford	Byron F. Card	Howland Mills.
New Bedford	Chas. C. Diman	Whitman Mills.
New Bedford	P. Y. DeNormandie	Potomska Mills.
New Bedford	Frederick Grinnell	Gen. Fire Ex. Co.
New Bedford	Henry A. Holcomb	New Bedford Boiler Co.
New Bedford	Nathaniel B. Kerr	Grinnell Manufg. Corp.
New Bedford	Walter H. Langshaw	Dartmouth Manufg. Corp.
New Bedford	Geo. H. Law	Bristol Manufg. Corp.
New Bedford	Stephen C. Lowe	Mill Supplies.
New Bedford	Andrew G. Pierce, Jr.	Pierce Manufg. Corp.
New Bedford	Herbert E. Walmesley	Wamsutta Mills.
New Bedford	Wm. R. West	Roll Coverer.
Newburyport	A. S. Winslow	Peabody Mills.
Newton	Josiah G. Coburn	
Newton Upper Falls	Frank J. Hale	Pettee Machine Works.
Newton Upper Falls	R. P. Snelling	Pettee Machine Works.
Newton Upper Falls	William B. Threlfall	Pettee Machine Works.
North Adams	Chas. W. Dennett	Johnson Manufg. Co.
Northbridge	Henry S. Houghton, Jr.	Paul Whitin Manufg. Co.
Northbridge	Henry T. Whitin	Paul Whitin Manufg. Co.
North Cambridge	Colin C. Bell	Laminar Fibre Co.
North Oxford	Edwin N. Bartlett	Sigourney and Rockdale Mills.
North Plymouth	Gideon F. Holmes	Plymouth Cordage Co.
North Uxbridge	Fred B. Whitin	Uxbridge Cotton Mills.
Oakdale	William B. Fittz	W. Boylston Manufg. Co.
Oakdale	Alfred N. Whiting	L. M. Harris Manufg. Co.
Reedville	Geo. E. Spofford	Reedville Cotton Mills.
Salem	William P. McMullen	Naumkeag Steam Cotton Co.
Saundersville	Thomas Wilmarth	Saunders Cotton Mills.
Shattuckville	Clifton L. Field	Massaemit Yarn Mills.

Shattuckville	Frank S. Field	Massaemit Yarn Mills.
Shirley	Henry D. Martin	Sampson Cordage Works.
Smithville	Geo. W. Robbins	J. Edwin Smith Mill.
South Hadley Falls	William R. Hill	Glasgow Manufg. Co.
Taunton	Wm. H. Bent	Mason Machine Works.
Taunton	John J. Connell	Cohannet Mills.
Taunton	Peter H. Corr	Cotton & Cotton Yarns.
Taunton	Thos. G. Cox	Mason Machine Works.
Taunton	P. T. Creed	Hopewell Mills.
Taunton	H. H. Culver	Elizabeth Poole Mill.
Taunton	Henry S. Culver	Cotton Mill.
Taunton	Herbert Fisher	
Taunton	Abbott F. Lawrence	Nemasket Mills.
Taunton	Henry M. Lovering	Whittenton Manufg. Co.
Taunton	William M. Lovering	Whittenton Manufg. Co.
Taunton	Chas. L. Macomber	Nemasket Mills.
Taunton	John Tempest Meats	Mason Machine Works.
Taunton	Herbert H. Shumway	Corr Manufg. Co.
Taunton	James W. Taylor	Canoe River Mills.
Thorndike	Charles H. Hobbs	Thorndike Co.
Three Rivers	Roscius C. Newell	Palmer Mills.
Turners Falls	Samuel L. Parker	Turners Falls Cotton Mills.
Waltham	Chas. L. Bailey	Boston Manufg. Co.
Waltham	Chas. E. Getchell	Waltham Bleachery and Dye Works.
Ware	George E. Tucker	Otis Co.
Webster	A. M. Hathaway	H. N. Slater Mills.
Webster	Henry C. Phillips	H. N. Slater Mills.
West Boylston	F. H. Rice	Holbrook Mills.
Westfield	Arthur W. Warren	W. Warren Thread Works.
West Warren	James W. Brown	Warren Cotton Mills.
Whitinsville	Alfred E. Adams	Whitinsville Cotton Mills.
Whitinsville	Josiah M. Lasell	The Whitin Machine Works.
Whitinsville	Oscar L. Owen	Whitin Machine Works.
Whitinsville	Arba C. Slater	Linwood Mills.
Whitinsville	Cyrus A. Taft	Whitin Machine Works.
Whitinsville	Arthur F. Whitin	Whitinsville Cotton Mills.
Whitinsville	G. Marston Whitin	The Whitinsville Machine Works.
Wilkinsonville	Ernest E. Clark	Sutton Manufg. Co.
Williamstown Sta.	Roland R. Kelly	Williamstown Manufg. Co.
Winchendon Springs	Z. L. White	White Bros.
Worcester	Henry F. Harris	W. Boylston Manufg. Co.
Worcester	C. H. Hutchins	Crompton & Knowles Loom Works.
Worcester	John M. Russell	Crompton & Knowles Loom Works.
Worcester	Justin A. Ware	Crompton & Knowles Loom Works.

RHODE ISLAND.

Albion	Andrew J. Currier	Valley Falls Co.
Allenton	R. A. Gray	Rodman Manufg. Co.
Anthony	Albert Knight	Quidnick Mills.
Ashton	Arthur H. Gulliver	Lonsdale Co.
Bayside, Warwick	Abel T. Atherton	
Central Falls	Stephen L. Adams	Stafford Manufg. Co.
Central Falls	Frank A. Jenks	U. S. Cotton Co.
Central Falls	O. B. Parker	U. S. Cotton Co.
Central Falls	George E. Sherman	
Centreville	Harold Lawton	Warwick Mills.
Centreville	Robert B. Treat	Centreville Cotton Mills.
Crompton	C. T. Richmond	Crompton Co.
Crompton	Charles D. Robinson	Crompton Co.
Davisville	Walter B. Knight	Reynolds Manufg. Co.
Georgiaville	Herbert R. Farnum	Bernon Mills.
Greenville	Reuben Pilling, Jr.	The Granite Mills Co.
Hamilton	Joseph Warren Greene	Hamilton Web Co.
Manville	Charles Henry Savage	Manville Co.
Pawtucket	William W. Blades	Lorraine Manufg. Co.
Pawtucket	William P. Dempsey	Dempsey Bleachery & Dye Works.
Pawtucket	David Jackson	Jackson Pat. Shell Roll Co.
Pawtucket	J. E. Jenckes	The E. Jenckes Manufg. Co.
Pawtucket	Jas. R. MacColl	Lorraine Manufg. Co.
Pawtucket	Fred A. Wilde	A. T. Atherton Machine Co.
Peace Dale	William C. Greene	Peace Dale Manufg. Co.
Phenix	Henry R. Brown	Hope Co.
Phenix	Jesse A. Knight	Harris Manufg. Co.
Pontiac	W. H. Summersby	Pontiac Mill and Bleachery.
Providence	Charles T. Aldrich	Aldrich Manufg. Co.
Providence	William Ames	Fletcher Manufg. Co.
Providence	George R. Babbitt	American Oil Co.
Providence	Truman Beckwith	Dyerville Manufg. Co.
Providence	J. Frank Braids	Chas. S. Bush Co.
Providence	D. Russell Brown	Brown Bros. Co.
Providence	H. Martin Brown	Brown Bros. Co.
Providence	E. C. Bucklin	Harris Manufg. Co. and Interlakea Mills.
Providence	Fred A. Chase	F. A. Chase & Co.
Providence	Charles H. Child	Brown Bros. Co.
Providence	Frank B. Comins	Aerphor Co.
Providence	Frederick I. Dana	Thomas Phillips Co.
Providence	A. Lockwood Danielson	Quinebaug Co.
Providence	J. DeForest Danielson	Lockwood Co.
Providence	John W. Danielson	Lockwood Co.
Providence	R. H. Deming	Cotton Broker.

Providence	J. Herbert Foster	Cotton Broker.
Providence	George A. Fuller	American Card Clothing Co.
Providence	William Gammell	Berkeley Co.
Providence	Rufus B. Goff	Standard Mill Supply Co.
Providence	William B. Gowdey	Mill Supplies.
Providence	William S. Granger	Granger Foundry & Machine Co.
Providence	John H. Hambley	Quidnick Manufg. Co.
Providence	A. Walter Harris	A. W. Harris Oil Co.
Providence	Elisha H. Howard	Harris Manufg. Co.
Providence	Joseph H. Kendrick	American Supply Co.
Providence	John M. Kimball	Slatersville Mills.
Providence	Stephen A. Knight	Hebron Manufg. Co.
Providence	Charles W. Lippitt	Silver Spring B. & D. Co.
Providence	Henry F. Lippitt	Social and Manville Cos.
Providence	Charles R. Makepeace	Mill Engineer.
Providence	F. H. Maynard	Gen. Fire Extinguisher Co.
Providence	Thomas Mayor	Textile Machinery.
Providence	William C. Peirce	Elizabeth Mills.
Providence	Stephen Minot Pitman	Narragansett Fire Ins. Co.
Providence	Thomas C. Powell	1 Custom House St.
Providence	Chas. A. M. Praray	C. R. Makepeace & Co.
Providence	Richard H. Rice	Rice & Sargent, Steam Engine Co.
Providence	Frank P. Sheldon	Mill Engineer.
Providence	Harry M. Smith	Standard Mills Supply Co.
Providence	George W. Stafford	Knowles Loom Works.
Providence	Daniel J. Sully	Cotton Broker.
Providence	Edward P. Taft	Ponemah Mills.
Providence	Robert W. Taft	Coventry Co. and Bernon Mills.
Providence	D. M. Thompson	Corliss Steam Engine Co.
Providence	A. Curtis Tingley	Nat. Ring Traveler Co.
Quidnick	Albert F. Knight	
Riverpoint	Arthur F. Brackett	Riverpoint and Arctic Mills.
Slatersville	Wm. P. Holt	Slatersville Mills.
Slatersville	Harry W. Kimball	Wm. A. Slater Mills Corp.
Valley Falls	Arnold B. Chace, Jr.	Woonsocket Mills.
Warren	Arnold Schaer	Warren Manufg. Co.
Warren	John Waterman	Warren Manufg. Co.
Westerly	Louis L. Hohn	Wm. Clark Thread Co.
Westerly	W. Marshall Taylor	Wm. Clark Thread Co.
Woonsocket	Malcolm Campbell	Woonsocket Mach. & Press Co.
Woonsocket	Chas. H. Gorton	Ballou Mills.
Woonsocket	Frank Harris	Hamlet Mills.
Woonsocket	Henry S. Houghton, Sr.	Grid Bars and Beaters.
Woonsocket	Chas. H. Merriman, Jr.	Social and Nourse Mills.
Woonsocket	Ariel C. Thomas	Clinton Manufg. Co.
Woonsocket	Charles E. Thomas	Forestdale Manufg. Co.
Woonsocket	A. Tenny White	Globe Mill.

CONNECTICUT.

Baltic	Robert Rennie Taft	Baltic Power Co.
Bozrahville	Ira J. Martin	Bozrahville Manufg. Co.
Hartford	William H. Stratton	Factory Ins. Asso.
Jewett City	J. Colby Lewis	W. A. Slater Mills.
Jewett City	James O. Sweet	Ashland Cotton Co.
Jewett City	A. A. Young, Jr.	Jewett City Mills.
Jewett City	Adelbert R. Young	Ashland Cotton Co.
Killingly	H. C. Atwood	Williamsville Manufg. Co.
Killingly	W. E. Atwood	Williamsville Manufg. Co.
Killingly	C. H. Truesdell	Attawaugan Co.
New Hartford	Robert R. Smith	Greenwoods Co.
New Haven	George S. Barnum	The Bigelow Co.
No. Grosvenordale	Frank M. Messenger	Grosvenor Dale Co.
Norwich	W. N. Blackstone	Attawaugan Co.
Norwich	W. R. Burnham	Uncasville Manufg. Co.
Norwich	C. H. Frisbie	Attawaugan Co.
Norwich	Marcellus Gould	Falls Co.
Norwich	W. G. Henderson	Shetucket Co.
Norwich	Moses Pierce	Aspinook Co.
Putnam	George W. Holt	Monohansett Manufg. Co.
Putnam	George A. Vaughan	Putnam Manufg. Co.
Taftville	Joseph D. Aiken	Ponemah Mills.
Taftville	John Eccles	Ponemah Mills.
Wauregan	James A. Atwood	Wauregan Mills.
Wauregan	John Walter Atwood	Wauregan Mills.
Willimantic	E. S. Boss	Willimantic Linen Co.
Willimantic	John Scott	Willimantic Linen Co.

NEW YORK.

Capron	W. H. Cloher, Jr.	Utica Cotton Co.
Cohoes	David S. Johnston	Cohoes Iron Foundry & Machine Co.
Cohoes	John E. Prest	Harmony Mills.
New York City	George Arms	Grand Hotel.
New York City	Edwin H. Baker	Bliss, Fabyan & Co.
New York City	Edward R. Ballou	Brighton Mills.
New York City	Arthur B. Mann	J. H. Martin & Co.
New York City	Dudley T. Lyall	Brighton Mills.
New York City	William L. Lyall	J. & W. Lyall Loom & Mach. Works.
New York City	Arthur Parkinson	The Arabol Manufg. Co.
New York City	Duncan D. Parmly	Johnson Mfg. Co.
New York City	Vladimir P. Polevoy	Jaroslavskaia Manufg. Co.
New York Mills, Oneida Co.,	John P. Campbell,	New York Mills.
Oswego	George H. Sayward	Standard Yarn Co.

Utica	D. W. Gray	Skenandoa Cotton Co.
Utica	Henry F. Mansfield	Utica Steam Cotton Mills.
Victory Mills	John O. Hannum	Saratoga Victory Manufg. Co.

NEW JERSEY.

Garwood	Wm. B. Munroe	Millville Manufg. Co.
Gloucester City	Philip H. Fowler	
Jersey City	Ernest Bridge	Jas. Chadwick & Bro. Ltd.
Millville	John K. Russell	May's Landing Water Power Co.
Newark	William Whittam, Jr.	Clark Mile End Spool Cotton Co.
Paterson	John W. Ferguson	General Contractor.

PENNSYLVANIA.

Chester	William Galey	Aberfoyle Manufg. Co.
Lancaster	S. S. Spencer	Conestoga Steam Mills.
Philadelphia	James Butterworth	H. W. Butterworth & Sons.
Philadelphia	Edward W. France	Phila. Textile Schools.
Philadelphia	Richard Garsed	Wingohocking Mills.
Philadelphia	W. C. Houston, Jr.	Hope Mills Manufg. Co.
Philadelphia	David Milne	C. J. Milne & Sons.
Philadelphia	George Wood	Millville Manufg. Co.
Philadelphia	John P. Wood	William Wood & Co.
Trainer	William E. Trainer	Linwood Mills.

DELAWARE.

Wilmington	William P. Bancroft	Joseph Bancroft & Sons Co.

MARYLAND.

Baltimore	James A. Gary	Gary Manufg. Co.

NORTH CAROLINA.

Charlotte	H. S. Chadwick	Dover Yarn Mill and Dilling Cotton Mills.
Charlotte	Ellison A. Smith	Charlotte Supply Co.
Charlotte	D. A. Tompkins	Atherton Mills.
Henrietta	Fred S. Mosher	Henrietta Mills.
Kings Mountain	Philip S. Baker	Crowders Mt. Cotton Mills.
Kings Mountain	F. Dilling	Dilling Cotton Mills.
Kings Mountain	C. E. Falls	Enterprise Mills.
Mountain Island	W. T. Jordan	Mt. Island Manufg. Co.
Pineville	J. P. Wilson	Dover Cotton Mills.
Reidsville	John W. Arrington	Edna Cotton Mills.

SOUTH CAROLINA.

Columbia	Charles K. Oliver	Columbia Mills Co.
Columbia	W. B. Smith-Whaley	Richland Cotton Mills.
Gaffney	H. D. Wheat	Gaffney Manufg. Co.
Greenville	Ellison A. Smyth	
Lancaster	Leroy Springs,	Lancaster Cotton Mills.
Langley	Arthur T. Smith	Langley Manufg. Co.
Newberry	Edward B. Wilbur	Newberry Cotton Mills.
Pelzer	B. F. Guy	Pelzer Manufg. Co.
Walhalla	Horace L. Hayden	Walhalla Cotton Mills.

GEORGIA.

Atlanta	J. F. Dickinson	So. Belting Co.
Atlanta	Oscar Elsas	Fulton Bag and Cotton Mills.
Atlanta	Henry E. Fisher	Atlanta Cotton Mills.
Atlanta	James R. Pearce	Fulton Bag and Cotton Mills.
Augusta	Otis G. Lynch	Enterprise Manufg. Co.
Augusta	Joel Smith	J. P. King Mfg. Co.
Augusta	George R. Stearns	Riverside Mills.
Columbus	E. N. Clemence	Eagle & Phenix Manufg. Co.
Griffin	Albert G. Martin	Kincaid Manufg. Co.
LaGrange,	Samuel Hale	Dixie Cotton Mills.
Lindale, Floyd Co.	Arthur W. Hunking	Mass. Mills in Georgia.
Savannah	Wm. A. Robinson	Savannah Cotton Mills.

TENNESSEE.

Knoxville	Wm. T. Lang	Brookside Mills.
Nashville	T. B. Dallas	Phenix Cotton Mills.

MISSOURI.

St. Louis	D. C. Ball	American Cotton Co.
St. Louis	Jerome Hill	Jerome Hill Cotton Co.

LOUISIANA.

New Orleans	S. Odenheimer	Lane Mills.

ALABAMA.

Huntsville	T. W. Pratt	West Huntsville Cotton Mills.

TEXAS.

Dickinson	Lawrence V. Elder	
Galveston	D. M. Ehrlich	Galveston Cotton Mills.
Temple	W. T. Bessonette	Cylindrical Bale.
Waco	Jno. Hopkinson	Slayden & Kirksey Woolen Mills.

CANADA.

Hamilton, Ont.	Charles Owen Dexter	Can. Colored Cotton Mills Ltd.
Hamilton, Ont.	Farquharson J. Muir	Can. Colored Cotton Mills Ltd.
Montreal, P. Q.	Alfred Hawkesworth	Merchants Manufg. Co.
Montreal, P. Q.	Fred Hawkesworth	Merchants Manufg. Co.
Montreal, P. Q.	W. S. Hume	Dominion Cotton Mills Ltd.
Valleyfield, P. Q.	Fred Lacey	Montreal Cotton Co.
Valleyfield, P. Q.	Louis Simpson	Montreal Cotton Co.

NEW BRUNSWICK.

Marysville	John B. Cudlip	Gibson Cotton Mills.
St. John	John H. Parks	Wm. Parks & Sons, Ltd.

RECAPITULATION.

LOCATION OF MEMBERSHIP.

Maine	19
New Hampshire	26
Vermont	2
Massachusetts	245
Rhode Island	91
Connecticut	27
New York	17
New Jersey	6
Pennsylvania	19
Delaware	1
Maryland	1
North Carolina	10
South Carolina	9
Georgia	12
Tennessee	2
Missouri	2
Louisiana	1
Texas	1
Alabama	4
Canada	7
New Brunswick	2
	495

IN MEMORIAM.

WILLIAM J. KENT.

WILLIAM J. KENT was born at Lonsdale, Rhode Island, March 9, 1853, and died at New Bedford, Mass., March 30, 1897. After graduating from the high school in his native town he entered the mills of the Lonsdale Company, of which his grandfather, GEORGE KILBURN, was agent, working in the carding, mechanical and drawing departments, and also in the machine shop. In 1877 he became draftsman and acted as assistant superintendent of the Naumkeag Mills at Salem, Mass., where he remained for one year under the able tutelage of Mr. JOHN KILBURN, the agent, and when Mr. KILBURN took charge of the Lawrence Manufacturing Company at Lowell, in 1878, Mr. KENT accompanied him as head draftsman and assistant superintendent of these mills, where he remained for three years. He then became superintendent of the Border City Mills at Fall River for one and a half years, leaving that position to take charge of the Grinnell Mills at New Bedford, of which he was the first superintendent from 1882 until December 31, 1887.

On January 1, 1888, he became agent of the Wamsutta Mills in New Bedford, in which position he exercised a broad admin-

trative capacity in conducting the extensive and varied lines of cotton manufacture produced in these mills.

Mr KENT'S thorough training gave him a strong grasp upon the details of cotton manufacture, while his insight was broad enough to take in the whole situation and equipped him with a balance of conservative enterprise which placed him in the forefront in the adoption of desirable improvements in manufacturing.

In his dealings with men his sunny geniality leave a memory replete with pleasant remembrances. This characteristic, combined with the capacity for organization, rendered him efficient in dealing with the complex problems of human relations in the employment of labor on an extensive scale. He took great interest in the more meritorious subordinates, freely assisting them to promotions even when he was aware that acts of personal kindness would deprive him of their services.

He became a member of this Association October 26, 1887, and always evinced deep interest in its affairs, devoting his fertility of mental resource in devising methods by which its usefulness could be extended; he became a member of the Board of Directors from 1891 to 1894, at which date he was elected Vice-President. He declined the nomination to the Presidency for reason that his interest in the establishment of the New Bedford Textile School constituted a pressing duty which necessitated the postponement of an honor which he considered to be worthy of any man's ambition.

The Transactions of this Association attest to his ability, not, however, in formal papers, which the demands of a busy life prevented him from preparing, but the discussion in which he gave freely of his vast resources of his exact experience.

He was recognized as a living force among the New England cotton manufacturers and was frequently called upon to advise in regard to the affairs of many other mill corporations.

RUFUS A. MAXFIELD.

RUFUS A. MAXFIELD died at his residence in Lowell, Mass., Nov. 21st, 1896, of hemorrhage of the bowels resulting in dropsy. About five years ago while making a trip through Japan he had a shock of paralysis and from that time to the day of his death his health was a subject of constant solicitude both to himself and to his friends.

Mr. MAXFIELD was born in Nashua, N. H., in 1835. His mill experience began there during his boyhood and was contined in Lowell and Salem. From 1869 to 1872 he was superintendent of the Mt. Ida Cotton Mill, Troy, N. Y.; from 1872 to 1875 he was superintendent of the Tremont and Suffolk Mills, Lowell; in 1875 he returned to Nashua to take the agency of the Nashua Manufacturing Co., in one of whose mills he had begun as a boy in the card-room thirty-two years before. He occupied the position of agent between eleven and twelve years, until July 1886, when he resigned and retired from active business. Shortly after this he took up his residence in Lowell and during the next few years he did considerable work in the way of appraising cotton mill property, for which his long and varied experience well qualified him; and he was retained as an expert witness in several important tax cases in Lowell and Lawrence.

During this time he was vice-president of the Northern New York Telephone Co.

Mr. MAXFIELD became a member of this Association in 1872 and served three years upon the Board of Government, from 1883 to 1886.

FRANK P. HADLEY.

FRANK P. HADLEY died at New Bedford, Mass., on April 23d at the close of a very busy life. He was born at New Bedford in 1850. He was a druggist until he became interested in cotton manufacturing in 1888, when he organized and started the New Bedford Yarn Mill. In February, 1889, he organized the Bennett Manufacturing Corporation, of which he became treasurer, and in 1892 the Columbia Spinning Company, and in 1894 the Lambeth Rope Company, of which he was president and treasurer. He was also interested in other New Bedford mills. He became a member of this Association, October 28th, 1891.

PROCEEDINGS.

In accordance with the legal notice, the stated annual meeting of this Association was held at Chipman Hall, Boston, Mass., on April 28 and 29, 1897.

The following 196 members were present:

ACTIVE MEMBERS.

ALFRED E. ADAMS, Whitinsville. Mass.
JOSEPH D. AIKEN, Taftville, Conn.
JOHN W. ARRINGTON, Reidsville, N. C.
ABEL ATHERTON, Bayside, Warwick, R. I.
H. C. ATWOOD, Killingly, Conn.
CHARLES L. BAILEY, Waltham, Mass.
EDWARD R. BALLOU, 541 West 23rd St., N. Y.
EDWIN N. BARLETT, North Oxford, Mass.
GEORGE W. BEAN, Lewiston, Me.
RICHARD B. BORDEN, Fall River, Mass.
STEPHEN N. BOURNE, Manchester, N. H.
CHRISTOPHER P. BROOKS, Lowell, Mass.
O. S. BROWN, Salmon Falls, N. H.
EDWARD N. BURKE, Lowell, Mass.
JOHN P. CAMPBELL, New York Mills, N. Y.
GEORGE A. CHACE, Fall River, Mass.
ALFRED CLARKE, Lowell, Mass.
ERNEST E. CLARK, Wilkinsonville, Mass.
JEREMIAH CLARK, Lowell, Mass.
JOSIAH G. COBURN, Newton, Mass.

Frank B. Comins, Providence, R. I.
John J. Connell, Taunton, Mass.
P. T. Creed, Taunton, Mass.
H. H. Culver, Taunton, Mass.
H. S. Culver, Taunton, Mass.
Andrew J. Currier, Albion, R. I.
Woodbury K. Dana, Westbrook, Maine.
Charles W. Dennett, North Adams, Mass.
Charles A. Denny, Leicester, Mass.
Eben S. Draper, Hopedale, Mass.
George Otis Draper, Hopedale, Mass.
Joseph M. Dunham, Holyoke, Mass.
Russell W. Eaton, Brunswick, Me.
John Eccles, Taftville, Conn.
Frederick W. Ely, Greenville, N. H.
William Firth, Boston, Mass.
Charles H. Fish, Dover, N. H.
William B. Fitz, Oakdale, Mass.
Frederick A. Flather, Lowell, Mass.
M. F. Foster, Milford, N. H.
Charles E. Getchell, Waltham, Mass.
Daniel Gilligan, Fall River, Mass.
Alfred M. Goodale, Boston, Mass.
Charles H. Gorton, Woonsocket, R. I.
Marcellus Gould, Norwich, Conn.
George P. Grant, Jr., Fitchburg, Mass.
D. W. Gray, Utica, N. Y.
R. A. Gray, Allenton, R. I.
John Gregson, Fall River, Mass.
Arthur H. Gulliver, Ashton, R. I.
Frank J. Hale, Newton Upper Falls, Mass.
Z. D. Hall, Providence, R. I.
A. M. Hamilton, Fall River, Mass.
John F. Hamlet, Fall River, Mass.
Joseph O. Hannun, Victory Mills, N. Y.
Henry F. Harris, Worcester, Mass.
Alfred Hawkesworth, Montreal, Can.
Fred Hawkesworth, Montreal, Can.
William Hayes, Auburn, Me.

James G. Hill, Lowell, Mass.
Charles H. Hobbs, Thorndike, Mass.
William P. Holt, Slatersville, R. I.
Henry S. Houghton, Jr., Northbridge, Mass.
Frank A. Jenks, Central Falls, R. I.
David S. Johnston, Cohoes, N. Y.
W. E. Keach, Pawtucket, R. I.
Joseph H. Kendrick, Providence, R. I.
Hervey Kent, Exeter, N. H.
Nathaniel B. Kerr, New Bedford, Mass.
John Kilburn, Belmont, Mass.
Harry W. Kimball, Jewett City, Conn.
John M. Kimball, Providence, R. I.
Jesse A. Knight, Phenix, R. I.
Stephen A. Knight, Providence, R. I.
Fred Lacey, Valleyfield, Can.
Harold Lawton, Centreville, R. I.
Evan Arthur Leigh, Boston, Mass.
J. Colby Lewis, Centreville, R. I.
Arthur H. Lowe, Fitchburg, Mass.
David Lowe, Fitchburg, Mass.
William Lyall, New York City.
Alvin A. Lyon, Lowell, Mass.
Charles R. Makepeace, Providence, R. I.
Henry D. Martin, Shirley, Mass.
Ira D. Martin, Bozrahville, Conn.
Thomas Mayor, Providence, R. I.
Robert McArthur, Biddeford, Me.
Fred C. McDuffie, Boston, Mass.
William G. McLoon, Waltham, Mass.
Frank M. Messenger, No. Grosvenor Dale, Conn.
W. H. Miles, Lisbon, Me.
Roscoe S. Milliken, Lawrence, Mass.
A. B. Mole, Adams, Mass.
Edward Mongeon, Blackstone, Mass.
Fred W. Moore, Millbury, Mass.
Albert H. Morton, Lowell, Mass.
William B. Munroe, Millville, N. J.
Roscius C. Newell, Three Rivers, Mass.

William G. Nichols, Clinton, Mass.
Franklin Nourse, Lowell, Mass.
Oscar L. Owen, Whitinsville, Mass.
Elmer E. Page, Saco, Mc.
O. B. Parker, Central Falls, R. I.
John H. Parks, St. John, N. B.
William C. Peirce, Providence, R. I.
Haven C. Perham, Lowell, Mass.
Henry C. Phillips, Webster, Mass.
Reuben Pilling, Jr., Greenville, Mass.
Herbert L. Pratt, Lewiston, Me.
John E. Prest, Cohoes, N. Y.
M. W. Quinn, Amesbury, Mass.
Robert Redford, Lawrence, Mass.
Roscoe C. Reynolds, Lewiston, Me.
Charles H. Richardson, Lowell, Mass.
Charles E. Riley, Boston, Mass.
George W. Robbins, Smithville, Mass.
Charles D. Robinson, Crompton, R. I.
John K. Russell, Millville, N. J.
Thomas C. Sheldon, Fitchburg, Mass.
William F. Sherman, Lawrence, Mass.
Herbert H. Shumway, Taunton, Mass.
Lewis Simpson, Valleyfield, Can.
William O. Smith, Easthampton, Mass.
George E. Spofford, Natick, R. I.
Walter F. Stiles, Fitchburg, Mass.
O. W. Sitts, No. Pownal, Vt.
Walter H. Summersby, Pontiac, R. I.
Albert A. Sweet, Fall River, Mass.
James O. Sweet, Jewett City, Conn.
James W. Taylor, Taunton, Mass.
Edward W. Thomas, Lowell, Mass.
Ralph E. Thompson, Fitchburg, Mass.
D. A. Tompkins, Charlotte, N. C.
William E. Trainer, Trainer, Penn.
Oscar B. Truesdell, Suncook, N. H.
George F. Tryon, Fall River, Mass.
William D. Twiss, Lawrence, Mass.

JOSEPH W. WATTLES, Canton Junction, Mass.
A. TENNY WHITE, Woonsocket, R. I.
HENRY T. WHITIN, Northbridge, Mass.
ALFRED N. WHITING, Oakdale, Mass.
GEORGE F. WHITTEN, Manchester, N. H.
HENRY M. WILCOX, Millbury, Mass.
THEOP. W. WILMARTH, Millbury, Mass.
THOMAS WILMARTH, Saundersville, Mass.
A. S. WINSLOW, Newburyport, Mass.
C. J. H. WOODBURY, Lynn, Mass.
ADELBERT R. YOUNG, Jewett City, Conn.

ASSOCIATE MEMBERS.

HENRY ASHWORTH, Fall River, Mass.
D. C. BALL, St. Louis, Mo.
COLIN C. BELL, No. Cambridge, Mass.
WILLIAM H. BENT, Taunton, Mass.
J. PAYSON BRADLEY, Boston Mass.
J. F. BRAIDES, Providence, R. I.
HENRY G. BRINCKERHOFF, Boston, Mass.
D. RUSSELL BROWN, Providence, R. I.
H. MARTIN BROWN, Providence, R. I.
JOHN H. BERGHARDT, Boston, Mass.
EUGENE E. BURNHAM, Lawrence, Mass.
JAMES BUTTERWORTH, Philadelphla, Pa.
MALCOLM CAMPBELL, Woonsocket, R. I.
W. W. CAREY, Lowell, Mass.
FRED A. CHASE, Providence, R. I.
CHAS. H. CHILDS, Providence, R. I.
THOS. G. COX, Taunton, Mass.
C. E. W. DOW, Lowell, Mass.
T. C. ENTWISTLE, Lowell, Mass.
GEO. A. FULLER, Providence, R. I.
H. P. GARLAND, Biddeford, Me.
ROYAL W. GATES, Lowell, Mass.
WILLIAM A. HAINES, Boston, Mass.
JOHN HAWORTH, Lowell, Mass.

JEROME HILL, St. Louis, Mo.
H. S. HOUGHTON, Woonsocket, R. I.
DAVID JACKSON, Pawtucket, R. I.
WM. B. KEHEW, Boston, Mass.
H. G. MCKERROW, Boston, Mass.
SIDNEY B. PAINE, Boston, Mass.
ARTHUR PARKINSON, New York City.
STEPHEN MINOT PITMAN, Providence, R. I.
VLADIMIR D. POLEVOY, New York.
CHARLES A. M. PRARAY, Providence, R. I.
JOHN M. RUSSELL, Worcester, Mass.
HARRY M. SMITH, Providence, R. I.
R. P. SNELLING, Newton Upper Falls, Mass.
HENRY C. SPENCE, Indian Orchard, Mass.
GEO. W. STAFFORD, Providence, R. I.
DANIEL J. SULLY, Providence, R. I.
CYRUS A. TAFT, Whitinsville, Mass.
WINTHROP THAYER, Boston, Mass.
FRANK H. UNDERWOOD, Boston, Mass.
JUSTIN A. WARE, Worcester, Mass.
WALTER S. WATSON, Lowell, Mass.
G. MARSTON WHITIN, Whitinsville, Mass.
FRED A. WILDE, Pawtucket, R. I.
ERVING Y. WOOLLEY, Boston, Mass.

MORNING SESSION.

CHIPMAN HALL, Boston, Mass., April 28, 1897.

The meeting was called to order at 11 A. M. by the President, Mr. ARTHUR H. LOWE in the chair, and the Secretary read the following call for the meeting.

BOSTON, MASS., April 1, 1897.

To the Members:

Notice is hereby given that the stated annual meeting of this Association will be held at Boston, Mass., Wednesday and Thursday, April 28 and 29, 1897. The sessions will be held in Chipman Hall, in the Tremont Temple Building, No. 88 Tremont Street, a short distance south of School Street, and opposite the Tremont Building. The entrance is at No. 88 Tremont Street, and Chipman Hall is on the sixth floor, reached by elevators.

The sessions will be called to order on Wednesday at 11 A. M., and 2 P. M., and on Thursday at 10 A. M., and 2 P. M.

It is requested that propositions for membership be sent in as soon as possible, to enable the Board of Government to take the necessary preliminary action.

The Board of Government desires that members shall examine the list of papers and topical questions for the purpose of being prepared to add their contribution to the discussion.

By order of the Board of Government,

C. J. H. WOODBURY,
Secretary.

The SECRETARY. Mr. President, I certify that I have mailed the call to the meeting to every member at least ten days in advance of the present date in accordance with Article 14 of the

Constitution of the Association, and that a quorum is now present.

With the call was enclosed a copy of the programme of the present meeting.

PROGRAMME.

First Session, Wednesday, April 28, 1897, at 11 A. M.

Call to Order.

Address of Welcome.
Mr. CURTIS GUILD, Jr., Boston, Mass.

President's Address.
Mr. ARTHUR H. LOWE, Fitchburg, Mass.

Election of Members.

Report of Secretary and Treasurer.

Election of Officers.

Second Session, Wednesday, April 28, 1897, at 2 P. M.

The Handling and Transportation of Cotton.
Mr. STEPHEN A. KNIGHT, Providence, R. I.

Cotton Transportation from a Railroad Standpoint.
Messrs. T. F. LEAVITT, Boston, Mass.
M. M. HURLEY, Louisville, Ky.
C. W. GIBSON, West Point, Miss.

The Round Bale and the New England Spinner.
Mr. D. C. BALL, St. Louis, Mo.

The Paul System of Drying.
Mr. HERBERT L. PRATT, Lewiston, Maine.

Third Session, Thursday, April 29, 1897, at 10 A. M.

The Lowell Textile School.
Mr. CHRISTOPHER P. Brooks, Lowell, Mass.

The Manufacture and Use of Spinning Rings.
Mr. GEORGE A. DRAPER, Hopedale, Mass.

The Ring Traveler: Its History and Progress in the Spinning and Twisting of Yarns.

Mr. A. CURTIS TINGLEY, Providence, R. I.

Ring Spinning.

Mr. ALFRED E. ADAMS, Whitinsville, Mass.

TOPICAL QUESTIONS.

81. In what particular is the mule as built to-day, an improvement for spinning fine numbers over those of ten years ago?

82. What is the best way to prevent double yarn on spinning frames where double boss rolls are used?

83. What is the best covering for the top rolls used on frames and mules that are to spin various numbers?

84. Metallic Drawing Rolls: Have they come to stay, and how far can they be adopted?

85. Spinning Rings: Does anyone know how to make them, and how large is it advisable to have them on the different numbers of yarn to be spun?

86. Is it practical to spin numbers finer than 65s on larger rings than 1½ with spindle running 9,000 revolutions?

Fourth Session, Thursday, April 29, 1897, at 2 P. M.

Electricity for Mill Purposes.

Mr. FRANK P. SHELDON, Providence, R. I.

Recent Advances in Weaving.

Mr. WILLIAM G. NICHOLS, Clinton, Mass.

Weaving as a Fine Art.

Mr. ALFRED HAWKESWORTH, Montreal, Canada.

Picking and Carding.

Mr. MARCELLUS GOULD, Norwich, Conn.

TOPICAL QUESTIONS.

87. What is the maximum length to put No. 100s on bobbin?

88. About how many yards ought a warper to run per minute on No. 100?

89. What is the best temperature and humidity for good spinning on fine counts?

90. Do you consider it practical to spool No. 120s yarn with the Wade bobbin holder?

The Growth of the Modern Factory System.
Mr. ALFRED M. GOODALE, Waltham, Mass.

Management of Country Mills.
Mr. RUSSELL W. EATON, Brunswick, Maine.

A Cotton Spinning Mill at Crefeld, Germany.
Department of State, Washington, D. C.
Hon. PETER V. DEUSTER, U. S. Consul.

Early Days of the New England Cotton Manufacturers' Association.
Col. SAMUEL WEBBER, Charlestown, N. H.

C. J. H. WOODBURY,
Secretary.

The PRESIDENT then introduced General CURTIS GUILD, Jr., who made an address on "Competition with New England Mills." Gen. GUILD'S address was followed by that of PRESIDENT LOWE, opening the meeting.

PRESIDENT'S ADDRESS.

ARTHUR H. LOWE, Fitchburg, Mass.

Gentlemen:—This is the sixty-second meeting and the thirty-first annual meeting of this Association. During these thirty-one years the Association has grown from small beginnings and a few members to one of great influence, having at present, including the members to be elected to-day, nearly 500 members. The Association is unique. It was organized by broad minded men, "for mutual assistance and friendly inter-

course." These words are taken from the Call for the meeting for organization, and I hope the Association will never depart from these noble purposes during all its interesting career of successful achievement.

"Mutual assistance" means the greatest development possible to united intelligence and energy. "Friendly intercourse" means good fellowship among men of kindred tastes and ambitions, without which business becomes drudgery and life a burden. Only a great good can come to an industry whose master minds are associated on such principles. As long as these principles actuate the Association it will more and more lead from egotisms and jealousies to the broader and stronger devolopment of the entire industry. I hope this spirit will so permiate and extend, that it will bring this Association into closer and closer relations with kindred Associations. My predecessor suggested an alliance and co-operation upon several matters with a certain association of treasurers. I have advocated and wish that we might consolidate several textile associations and have in this country an organization similar to the one in Manchester, England, with its exchange and market days.

There is no reason why fundamental principles, upon which development and success of an industry depends, should not be imparted as freely as the "cup of cold water." Our industry is developed by the proper location and construction of our mills; by the selection of the best machinery, and the best arrangement and operation of it; by knowing the best methods of heating and ventilation; and by throwing proper safeguards about the employees to protect against sickness and accidents.

I believe that if we could have free and frank discussions of the labor question from the honest and conscientious standpoint of the managers and superintendents, contrasting the uncontrolable conditions of the markets and the sincere desires of these men, with the selfish dispositions of many of the labor agitators and the hard, unfeeling dictates of the labor unions, many of the labor troubles and strikes would be avoided and a closer interest between the employer and employee established. If

the Association by discussion of these questions can reduce the burdens of labor and improve the conditions of health in our mills, it will accomplish a great result.

Secret methods, or processes for fancy or special results, new combinations of colors, and new designs, are not to be revealed, and any fear that they will be, must be dismissed from the minds of all. The inventors of new devices or machinery are always diligent and alert to show them and have them adopted. When these devices and improvements become common property nothing but good can come from a discussion of the experience with them, by the members of an association like this.

Good will come from agitations for better cultivation of cotton, better picking, better baling, better transportation arrangements and safer methods of storage. We expect interesting papers upon transportation at this meeting.

I believe this Association can profitably discuss the question of markets and methods of selling and placing the goods in the hands of the consumers. I am fully aware that some of these subjects have been considered as being outside the pale of the Association, but I believe the time has come when they rightfully belong to the Association to meet and to discuss.

The consideration of these matters offer a field broad enough to tax the abilities of all the presidents, treasurers, agents, and superintendents of the mills in this country, and I wish the Association had all upon its list of members.

Now, gentlemen, I come to what I consider the most important matter before the meeting — important, because it has to do with the future work and results of the Association. The past is history, the future is full of opportunities and promise. At our last meeting Mr. RUSSELL W. EATON, of Brunswick, Me., presented some very important suggestions in regard to the future work of the Association; these suggestions provoked an interesting discussion, that I hope you have all read in the Transactions. The proposition is, as I understand it, to divide the work of this Association into departments. These departments to be under the immediate supervision of commit-

tees, and the chairmen of these committees may make up the Board of Government. I hope something will be done at this meeting towards carrying out this scheme. The suggestion proves the growing, developing condition of this Association.

I have touched upon what might be three or four of these departments and along these lines will propose the following:

First, the cultivation, baling, transportation, handling and storing of cotton.

Second, the location, construction, heating and ventilation of mills. This might cover questions of valuation and taxation.

Third, the selection, arrangement and operation of machinery. This would include power, new inventions, etc.

Fourth, the labor and condition of employees. This might include the relation of the factory to the community in which the mill is located.

Fifth, the markets and methods of handling and selling the products.

And *Sixth*, I suggest a department of ways and means, having in charge the details of the Association, compilation of transactions, and arrangement of programs for the meetings. This committee might keep the Association advised upon the actions of legislatures affecting the industry in different States and keep in touch with textile education. It seems to me there is work enough in any one of these departments for such a committee as would have it in charge.

Now, gentlemen, let us consider this proposition thoroughly, and if the scheme is approved, let us take some action, either referring it to the incoming Board of Government with power to arrange the departments and appoint the committees, or appoint a special committee to consider the matter and report to our next meeting [Applause]. Furthermore, I believe that the time has come when it would be profitable to hold four meetings during the year instead of two.

I doubt if there has even been a more trying time for textile manufacturers than at present, and there never was a time in the history of this Association when its members needed the sympa-

thy, confidence and encouragement of each other more than now, or when they needed to be more alert to adopt every improvement in machinery and process.

A few figures taken from the *Textile World's* annual return show, however, that they are not all disheartened and discouraged. The report shows that there were 207 new textile industries started in 1896, of which 66 were cotton mills. It also shows that there were 382,045 spindles put into Southern cotton mills and 240,352 put into New England mills. The report still further shows a most notable increase in new knitting mills; 85 concerns of this class were constructed in 1896. The Report concludes as follows: "There is a good deal of encouragement in the textile statistics; they demonstate that even in such a year as the past has been, the American manufacturers have not lost their courage or relaxed their grip on their industries. Their pluck deserves success."

The following figures taken from "Dockham's Directory" are encouraging. The figures show that there are 18,753,935 cotton spindles in the United States, against 17,126,418 in 1894. The South is making rapid strides in this industry, having increased their spindles to 3,629,845 in 1896.

These Southern manufacturers appreciate the importance and benefit of association, and have organized the Southern Manufacturers' Textile Association. At our meeting in September, held at the Profile House, it was voted that the Board of Government arrange for a meeting of the Association in Philadelphia, in the autumn of 1897, and it was urged that the meeting be a joint meeting with the Southern Association. I believe that great good will result from the carrying out of that plan and trust that it will be done. I think that the nearer we get to our southern friends in the industry the better.

Since our last annual meeting the Lowell Textile School has been organized, equipped, and dedicated. I should feel disposed to enlarge somewhat upon this subject if we were not to have a paper presented to the Association by one much better qualified than myself to do so.

The New England Cotton Manufacturers' Association, however, has a vital interest in this, the first Textile School established in New England, and should lend its utmost encouragement to its success. This Association has always favored the establishment of these schools in New England and have done much to bring about the establishment of this one in Lowell. They certainly wish it, as well as the spendidly organized school in Philadelphia, a grand success.

The Board of Government has arranged a programme, and some of the members have prepared papers for this meeting which I believe will be extremely interesting and instructive. I hope the discussions of the papers will be entered into heartily and freely. The discussion by the members is really the thing that gets at the meat of the matter and that makes our meetings most valuable.

One year ago I accepted the Presidency of this Association with many misgivings; I felt myself handicapped by not having a larger acquaintance among its members and a more scientific knowledge of the art. The work of the year has been very pleasant to me, made so by the many kindnesses received from the members of the Association and by the hearty encouragement and co-operation of the Board of Government, and the Secretary. I thank you all most sincerely. I have received many letters during the year asking information on various subjects, some of which I felt capable of answering, but more of which were referred to better sources of information.

The Association during the past year has received many complimentary criticisms from the press, and its increasing many friends. I was told by the secretary of one of the leading organizations in the country that "the published reports of the Transactions of this Association with its many papers upon the many subjects which have been brought before its meetings was considered the most valuable commentary in existence upon any industry." One of the prominent papers speaking of the semi-annual reports of the Association said, "the privilege of receiving them regularly is worth far more than the present

annual dues of the Association. The report of the Profile meeting from Sept. 22 to Sept. 24, 1896, has just come to hand and is a superb volume of 359 pages. The members of the Association feel that it is a valuable privilege to secure a file of these reports, and the present roll of 500 members will doubtless increase to 1,000 in the near future, forming the strongest organization of the kind in the world." [Applause.]

The PRESIDENT. The next business is the election of new members. The Secretary will read the list as approved by the Board of Government for election.

The SECRETARY. The Board of Government, by a vote, recommend the election of SAMUEL WEBBER of Charlestown, N. H., for honorary membership, he being a retired cotton manufacturer and having been the Secretary of the first preliminary meeting which resulted in the formation of this organization, as will be presented before you later by the paper on "The Early Days of the New England Cotton Manufacturers' Associations."

The Secretary then read the following ballot, which had been approved by the Board of Government:

FOR HONORARY MEMBERSHIP.

SAMUEL WEBBER, Charlestown, N. H.
Proposed by vote of the Board of Government.

FOR ACTIVE MEMBERSHIP.

FRANK A. BOWEN, Supt. Appleton Co., Lowell, Mass.
By Mr. J. I. MILIKEN.

CHRISTOPHER P. BROOKS, Director Lowell Textile School, Lowell, Mass.
By Mr. WILLIAM G. NICHOLS.

HENRY R. BROWN, Supt. Hope Co., Phenix, R. I.
By Mr. R. A. GRAY.

J. H. C. Church, Asst. Treas. Monument Mills, Great Barrington, Mass.
By Mr. T. G. Ramsdell.

E. N. Clemence, Sec. and Treas. Eagle & Phenix Mfg. Co., and Agt. for Receivers, Columbus, Ga.
By Mr. C. E. W. Dow.

John B. Cudlip, Supt. Gibson Cotton Mill, Maryville, New Brunswick.
By Mr. Arthur H. Lowe.

H. H. Culver, Supt. Elizabeth Poole Mill, Taunton, Mass.
By Mr. Jas. W. Taylor.

Henry S. Culver, Supt. Whittendon Mfg. Co., Westville Mill, Taunton, Mass.
By Mr. John J. Connell.

Oscar Elsas, Vice-Pres. Fulton Bag and Cotton Mills, Atlanta, Ga.
By Mr. J. R. Pearce.

William Galey, Pres. Aberfoyle Manufg. Co., Chester, Pa.
By Mr. Edward W. France.

A. M. Hamilton, Supt. Parker Mills, Fall River, Mass.
By Mr. John Eccles.

Louis L. Hohn, Supt. Wm. Clark Thread Co., 122 High St., Westerly, R. I.
By Mr. W. W. Blades.

W. C. Houston, Jr., Pres. Hope Mills Manufg. Co., 333 Drexel Building, Philadelphia, Pa.
By Mr. Edward W. France.

Frank A. Jenks, Agt. United States Cotton Co., Central Falls, R. I.
By Mr. O. B. Parker.

Benjamin B. Kirk, Supt. Shove Mills, Fall River, Mass.
By Mr. Daniel Gilligan.

Wm. T. Lang, Supt. Brookside Mills, Knoxville, Tenn.
By Mr. F. J. Hale.

George H. Law, Supt. Bristol Manufg. Corp., 64 Willis St., New Bedford, Mass.
By Mr. Robert Burgess.

Leontine Lincoln, Pres. Seaconnet Mills, Fall River, Mass.
By Mr. George A. Chase.

HENRY D. MARTIN, Supt. Samson Cordage Works, Shirley, Mass.
By Mr. JAMES P. TOLMAN.

JOHN R. MASON, Supt. Laurel Lake Mills, Fall River, Mass.
By Mr. ABBOTT E. SLADE.

DAVID MILNE, of C. J. Milne & Sons, Washington Ave. and 11th St., Philadelphia, Pa.

By Mr. EDWARD W. FRANCE.

J. EDWARD OSBORN, Treas. American Linen Co., Fall River, Mass.
By Mr. R. B. BORDEN.

CHARLES T. PLUNKETT, Sec. Berkshire Cotton Mfg. Co., Adams, Mass.
By Mr. ARTHUR H. LOWE.

C. T. RICHMOND, Mgr. Fustian Dept., Crompton Co., Crompton, R.I.
By Mr. C. D. ROBINSON.

GEORGE W. ROBBINS, Supt. J. Edwin Smith Mill, Smithville, Mass.
By Mr. WILLIAM G. NICHOLS.

WILLIAM O. SMITH, Agt. Easthampton Spinning Co., Easthampton, Mass.
By Mr. FRED W. MOORE.

GEORGE F. TRYON, Supt. Conanicut Mills, Fall River, Mass.
By Mr. N. B. KERR.

CHARLES T. UPTON, Supt. Lowell Hosiery Co., Lowell, Mass.
By Mr. HAVEN C. PERHAM.

FREDERICK T. WALSH, Agt. Lowell Bleachery and Dye Works, Lowell, Mass.

By Mr. E. W. THOMAS.

Z. L. WHITE, White Bros., Winchendon Springs, Mass.
By Mr. F. C. MCDUFFIE.

FRED B. WHITIN, Supt. Uxbridge Cotton Mills, North Uxbridge, Mass.
By Mr. HENRY T. WHITIN.

JOHN P. WOOD, of William Wood & Co., 521 North 22d St., Philadelphia, Pa.

By Mr. EDWARD W. FRANCE.

FOR ASSOCIATE MEMBERSHIP.

HENRY ASHWORTH, Card Clothing Manufacturer, Fall River, Mass.
By Mr. T. G. COX.

J. FRANK BRAIDES, Manager Oil and Grease Dept. Charles S. Bush Co., Providence, R. I.
By Mr. S. A. KNIGHT.

JOHN T. FYANS, Agt. Fyans, Frazer & Blackway, 411 Beach St., Fall River, Mass.
By Mr. JOHN F. HAMLET.

RUFUS B. GOFF, Pres. Standard Mill Supply Co., 77 Exchange Place, P. O. Box 714, Providence, R. I.
By Mr. R. A. GRAY.

HENRY S. HOUGHTON, SR., Mfr. Grid Bars and Beaters for Cotton Pickers, 65 Port St., Woonsocket, R. I.
By Mr. R. A. GRAY.

ARTHUR PARKINSON, Selling Agent The Arabol Mfg. Co., 13 Gold St., New York City.
By Mr. J. COLBY LEWIS.

VLADIMIR P. POLEVOY, Purchasing Agt. Great Jaroslavskaia Manufg. Co. (of Jaroslave), Russia, 120 Broadway, New York.
By Mr. GEORGE A. DRAPER.

CHARLES A. M. PRARAY, of C. R. Makepeace & Co., Mill Architect and Engineer, Providence, R. I.
By Mr. H. H. SHUMWAY.

HARRY M. SMITH, Vice-Pres. Standard Mill Supply Co., 77 Exchange Pl., Box 714, Providence, R. I.
By Mr. R. A. GRAY.

WILLIAM H. STRATTON, Asst. Mgr. Factory Insurance Asso., 95 Pearl St., Hartford, Conn.
By Mr. STEPHEN GREENE.

FRED A. WILDE, Asst. Mgr. The A. T. Atherton Machine Co., Pawtucket, R. I.
By Mr. A. T. ATHERTON.

The PRESIDENT. Gentlemen, you have heard the list of names read. These names have been before the Board of Government and are recommended by the Board of Government for membership. The President will appoint as a committee to col-

lect and count the ballots, Mr. THOMAS G. COX and Mr. ERVING Y. WOOLLEY.

The committee preceeded to the discharge of their duties.

The collection of the ballots having been completed,—

The PRESIDENT said: Have all voted who wish? If so, I declare the ballot closed. The ballot is closed.

In order to save time, while the ballots are being counted the Secretary will read his report.

REPORT OF SECRETARY AND TREASURER.

TREASURER'S REPORT.

C. J. H. WOODBURY, TREASURER, IN ACCOUNT WITH THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

April 1, 1896 to April 1, 1897.

Dr.

Cash on hand April 1, 1896,	$521 61	
Active membership dues,	1,920 00	
Associate membership dues,	690 00	
Active admission fees,	410 50	
Associate admission fees,	450 00	
Rent of desk room,	100 00	
Sale of Transactions and miscellaneous,	91 53	
Association fund,	1,000 00	
Interest,	47 99	
Total,		$5,231 63

Cr.

Rent of office,	$595 83	
Secretary and Treasurer,	500 00	
Reports of meetings,	189 40	
Notices, envelopes, stationery,	88 50	
Meeting expenses,	199 31	
Expenses of Board of Government,	279 12	
Printing and distributing Transactions,	1,401 54	
Advance copies of papers,	60 00	
Engraving,	67 55	
Amount forward,		$3,381 25

Amount forward,	$3,381 25	
Badges,	85 00	
Stenographer and proof-reading,	473 49	
Post office box,	10 00	
Postage, telegram and express,	148 43	
Office furniture and supplies,	20 00	
Miscellaneous,	8 00	
Securities and cash,	1,105 46	
Total,		$5,231 63

AUDITOR'S REPORT.

I hereby certify that the accounts from April 1, 1896, to April 1, 1897, are correctly cast, that all payments are properly vouched by bills approved by the Auditing Committee of the Board of Government, that the funds are kept on deposit in the name of the New England Cotton Manufacturers' Association, and that the amount of deposit April 1, 1897, agrees with the balance on the books, viz., $105.46. The security in which the Association funds have been invested has been examined.

CHAS. B. AMORY,
Acting Auditor.

Boston, April 15, 1897.

The Board of Government requested Mr. CHARLES B. AMORY to serve as acting auditor on account of the illness of the Auditor, Mr. JOSEPH H. SAWYER.

During the last few years, the growing income of the Association has been such that the Board of Government have invested one thousand dollars in an Association fund, to which it is hoped to make additions in the future; but this very prosperity has entailed other conditions which have of late rendered such an increase unfeasible.

It has been the policy of the Board of Government to use its possessions for the direct benefit of the membership and the fertility of resource of the membership has occasioned an embarrassment of riches, for which the large size of the "Transactions" as well as the quality of the contributions are evidence of record.

The "Transactions" issued during the past year cover 628 pages, which is practically the same as last year.

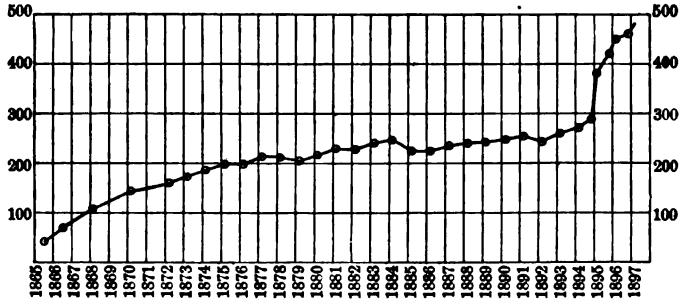
During the last year, there has been a change in the Transactions from paper covered wire-stitched pamphlets to sewed books bound in boards with cloth backs. This has required a considerable increase in the cost of binding, which will not be of any value to those who follow the general custom of having their volumes bound together into volumes of convenient size.

While other technical societies have their counterparts in other parts of the country, this Association is unique in being the only organization of its kind, presenting a semi-annual record of the best observation and experience on the subject of cotton manufacturing.

In another respect it is without parallel, and that is that the dues are half or less of those in other technical societies issuing transactions, which has been accomplished by strict economy and to a certain extent the use of admission fees for running expenses.

With few exceptions, it appears to be considered that the preferable contributions are those papers which consist of short, terse articles upon some point in cotton manufacturing, which concentrate upon the matter in hand and also serve as the direct purpose of short discussions by many members.

The growth of membership during its organization is shown by the following diagram, in which the vertical lines represent the successive years, while the height of the irregular lines indicates the number of members at the several dates:



With the progress of time the Association has more of a history, and the records of the past become of greater value as furnishing a broader base upon which to plan for the future, for it cannot be stationary — either retrogression or progress is inevitable. As in every business, there is a natural shrinkage which must be met by an increase in other directions, so that a constant accession of new members is essential to recoup the loss of members caused by death, resignation,— and not keeping up a regular correspondence with Treasurer. During the last three years there has been a growth of 225 in the membership from the election of 256; the difference of 31 being accounted for by 15 deaths, 7 resignations, 4 not qualifying for membership, and 5 lapsed dues to the Association.

It is often remarked by those whose membership is of long duration, that they fail to see the usual number of old faces at the meetings, and this is indeed true, for the records are also an index of the mutations of life. Nearly one name to every three requires some changes in the published lists of membership every year. The history of the Association is the record of an organization and not a biography of individuals.

The following table shows the membership of the Association at various dates since its organization, and also the number of present members elected at the various dates. Including the original members, there have been 965 elections to membership.

MEMBERSHIP OF THE ASSOCIATION.

Number of Meeting.	Date of Meeting.	Membership.	Number of Present Members.	Number Elected to Membership.
1	Apr. 20, 1865, ...	44	7	—
	July 19, 1865, Adj. Meeting,	—	1	—
2	July 18, 1866, ...	72	3	—
3	July 17, 1867, ...	—	1	10
4	Jan. 15, 1868, ...	108	4	14
5	July 15, 1868, ...	—	0	11
	Oct. 21, 1868, Adj. Meeting,	—	1	6
6	Apr. 21, 1869, ...	—	4	20
7	Oct. 20, 1869, ...	—	2	8
8	Apr. 20, 1870, ...	144	0	9
9	Oct. 19, 1870, ...	—	1	5
10	Apr. 19, 1871, ...	—	3	9
11	Oct. 18, 1871, ...	—	3	16
12	Apr. 17, 1872, ...	166	5	27
13	Oct. 16, 1872, ...	—	3	12
14	Apr. 16, 1873, ...	175	2	13
15	Oct. 15, 1873, ...	—	4	19
16	Apr. 15, 1874, ...	189	1	12
17	Oct. 21, 1874, ...	—	0	7
18	Apr. 21, 1875, ...	199	5	13
19	Oct. 27, 1875, ...	—	2	18
20	Apr. 26, 1876, ...	200	1	13
21	Oct. 25, 1876, ...	—	2	14
22	Apr. 25, 1877, ...	213	4	20
23	Oct. 31, 1877, ...	—	3	12
24	Apr. 24, 1878, ...	210	6	6
25	Oct. 30, 1878, ...	—	4	12
26	Apr. 30, 1879, ...	205	5	10
27	Oct. 29, 1879, ...	—	7	17
28	Apr. 28, 1880, ...	219	2	16
29	Oct. 27, 1880, ...	—	3	13
30	Apr. 27, 1881, ...	231	4	12
31	Nov. 30, 1881, ...	—	2	5
32	Apr. 26, 1882, ...	231	2	9
33	Oct. 25, 1882, ...	—	4	7
34	Apr. 25, 1883, ...	240	5	15
35	Oct. 31, 1883, ...	—	4	10
36	Apr. 30, 1884, ...	247	4	9

Number of Meeting.	Date of Meeting.	Membership.	Number of Present Members.	Number Elected to Membership.
37	Oct. 29, 1884, ...	—	2	3
38	Apr. 29, 1885, ...	225	3	3
39	Oct. 28, 1885, ...	—	7	8
40	Apr. 28, 1886, ...	225	4	7
41	Oct. 27, 1886, ...	—	8	8
42	Apr. 27, 1887, ...	234	5	13
43	Oct. 27, 1887, ...	—	2	3
44	Apr. 25, 1888, ...	241	11	15
45	Oct. 31, 1888, ...	—	8	13
46	Apr. 24, 1889, ...	242	5	6
47	Oct. 30, 1889, ...	—	6	9
48	Apr. 30, 1890, ...	246	7	7
49	Oct. 29, 1890, ...	—	9	11
50	Apr. 29, 1891, ...	254	4	4
51	Oct. 28, 1891, ...	—	6	8
52	Apr. 27, 1892, ...	244	12	12
53	Oct. 26, 1892, ...	—	16	19
54	Apr. 26, 1893, ...	259	8	10
55	Oct. 25, 1893, ...	—	8	9
56	Apr. 25, 1894, ...	270	13	14
57	Sept. 27, 1894, ...	292	18	21
58	Apr. 24, 1895, ...	383	84	94
59	Oct. 24, 1895, ...	422	45	48
60	Apr. 29, 1896, ...	450	28	30
61	Sept. 22, 1896, ...	459	18	19
62	Apr. 28, 1897, ...	495	44	44
	Totals,		495	965

The Board of Government has held fourteen meetings during the year, and has kept in close touch with the details of the duties for which they were elected.

The headquarters in the John Hancock Building have been kept open as usual during the past year, and have been used by 125 members for a business headquarters when in Boston, attending to correspondence and business conferences, also for consultation of the library, and a probably larger number of persons not known to be members have called to obtain infor-

mation, to consult the library, or upon some matter pertaining to cotton manufacture. The following periodicals are sent regularly by the publishers and are kept on file:

"American Knit-Goods Review."
"American Wool and Cotton Reporter," Boston, Mass.
"Boston Journal of Commerce," Boston, Mass.
"Cassier's Magazine," New York City.
"Dixie," Atlanta, Ga.
"Dry Goods Economist," New York City.
"Electrical Review," New York City.
"Engineers' Record," New York City.
"Fibre and Fabric," Boston, Mass.
"Home Market Bulletin," Boston, Mass.
"Iron Age," New York City.
"Manufacturers' Record," Baltimore, Md.
"Mill and Shop," Boston, Mass.
"Power," New York City.
"Power and Transmission," Mishawauka, Ind.
"Southwestern Manufacturer," Kansas City, Mo.
"Textile America," New York City.
"Textile World," Boston, Mass.

Also transactions of the following technical societies:

"American Society of Civil Engineers," New York City.
"American Society of Mechanical Engineers," New York City.
"American Institution of Electrical Engineers," New York City.
"Boston Chamber of Commerce," Boston, Mass.
"Bureau of the American Republics," Washington, D. C.
"Consular Reports," Department of State, Washington, D. C.
"National Association of Wool Manufacturers," Boston, Mass.
"National Electric Light Association," New York City.
"Western Society of Engineers," Chicago, Ill.

And many occasional publications.

The Association has been asked to join in good works and in matters which may be subject to criticism, during the past year, but have kept the principle of refraining from entering into any alliances or extending beyond what is considered to be the regular work of this Association; a possible exception being the appointment of Vice-President KENT to serve on the Advis-

ory Board of the Philadelphia Museums, whose work was presented before the Association at the Profile Meeting.

During the last part of the year the severe illness of Mr. WILLIAM J. KENT deprived the Board of Government of the advantage of his action and counsel, and it is the unwelcome duty of the Secretary to announce to the Association that his death occurred at New Bedford on the 30th of March, and at the funeral on the 1st of April, the Association was represented by sixteen members from outside of the city of New Bedford.

At the meeting of the Board of Government held Wednesday, April 21, the following resolution was spread upon its records, and recommended to the consideration of the Association:

Resolved, That Vice-President WILLIAM J. KENT will be held in remembrance as a man of brilliant attainments and sterling integrity, who was thoroughly versed in the art of cotton manufacturing, both in administrative capacity and mastery of the process; and by his death we have been bereaved of a friend, and the industry has lost one of its leaders.

Resolved, That this be spread upon the records, and a copy sent with respectful sympathy to his family.

It has been the function of the officers of the Association to place upon the records the contributions of the members, and if the "Transactions" have proved satisfactory it is because they contain in concrete form the experience and observation upon matters pertinent to the art of cotton manufacturing contributed by a large number of individuals, and the Association has been what the members make it, and cannot be anything else.

Respectfully submitted,

C. J. H. WOODBURY,

Secretary and Treasurer.

Mr. ROBERT MCARTHUR. I move, Mr. President, that the report of the Secretary and Treasurer be accepted and that the resolutions passed by the Board of Government to the memory of Vice-President KENT, be approved and adopted by the Association.

The motion was seconded and carried.

The SECRETARY. Mr. President, I would say that notices of election have been prepared and addressed to the new members who can, if they desire, obtain them here, or they will be mailed at the conclusion of this session and they will get them at their homes

I have also a communication from the trustees of the Lowell Textile School, by Mr. JAMES T. SMITH, clerk to the trustees: "I am therefore instructed to invite the members of your Association to visit the Lowell Textile School, preferably on Wednesday or Thursday, the 28th and 29th inst. The school is open from 9 A. M. to 9 P. M., and individual members will be shown through at any hour. The school is situated in Parker Block, Middle and Merrimack Streets, Lowell."

It is very desirable that the Secretary should have a list of those members and members-elect who attend this meeting, and with that object in view there is a young man at the desk in the entry who checks off the names and gives each a badge. If any members or members-elect have not given their names to him and obtained their badges, will they kindly do so and also assist the Secretary in repeating this notice to others who may come later.

The Secretary has received a letter from Mr. JAMES HUSSEY of 2311 Freret Street, New Orleans, La., giving a sample of a curious fibre, which is apparently of vegetable material and very long. Perhaps it may be of some curiosity to the members, perhaps more so at a later date than today, as I have sent to New Orleans for a large quantity of it for the purpose of such experiments as the members may choose to make upon it.

The PRESIDENT. The next business before the Association is the election of officers. The terms of the following officers expire at this time by limitation: that of President, First Vice-President, Second Vice-President, and Mr. HENRY T. WHITIN and Mr. RUSSELL W. EATON of the Board of Directors. What action is it your pleasure to take at this time?

Mr. ROBERT MCARTHUR. I move, Mr. President, that a committee of three be appointed to report a list of officers to serve this Association for the ensuing year.

The motion was seconded and carried.

The PRESIDENT. The President will appoint as that committee Mr. ROBERT MCARTHUR, Mr. JOHN K. RUSSELL and Mr. HAVEN C. PERHAM. This committee will report at a later session. It has become the custom of the Association that the retiring president shall preside at the last meeting of the Association during his term of office, having had to do with the preparation of the material. This committee will report and the officers be elected at a later session of the meeting.

Mr. ROBERT MCARTHUR. I would ask, Mr. President, at what session, today or tomorrow?

The PRESIDENT. That shall be at the pleasure of the committee, I think.

Mr. ROBERT MCARTHUR. It will be as well if they report tomorrow morning?

The PRESIDENT. Yes, sir.

This closes the first session so far as the programme has been made out. I am very glad to see so large an attendance this morning, and I hope there will be a prompt gathering at two o'clock for the afternoon session. It will be one of the most interesting sessions that we shall have.

[Recess at 12.35 P. M.]

SECOND SESSION.

WEDNESDAY, APRIL 28, 1897, 2 P. M.

Meeting called to order, President LOWE in the chair.

The following papers were read:

The Handling and Transportation of Cotton.

STEPHEN A. KNIGHT, Providence, R. I.

Discussed by Messrs. LOUIS SIMPSON, STEPHEN N. BOURNE and JEROME HILL.

Cotton Transportation from a Railroad Standpoint.

T. F. LEAVITT, Boston, Mass.
M. M. HURLEY, Louisville, Ky.
C. W. GIBSON, West Point, Miss.

Discussed by Messrs. STEPHEN A. KNIGHT, LOUIS SIMPSON and D. A. TOMPKINS.

The SECRETARY. Mr. President, the Boston Transit Commission invites the members of this Association to inspect the subway tomorrow afternoon. This will be probably the last time that a body of people will have the opportunity of going through the subway, as they are rapidly putting down the sleepers and rails and laying the wires. If the members will enter the subway at the corner of the Public Garden, about opposite the Thorndike Hotel, between quarter of two and two o'clock tomorrow, they will be taken through the subway.

Mr. CHARLES H. RICHARDSON. Mr. President, I would like to inquire if the Secretary can tell us anything about the condition of the subway at the present time, as to the travelling through it, whether it is in condition so that we can get through it easily?

The SECRETARY. I think it is dryer than it was. I hope it is. Perhaps some of the other gentlemen have been in there lately.

Mr. CHARLES H. RICHARDSON. The last time I was in there the mud was nearly knee deep. I don't know whether it is that way now or not.

Mr. ALFRED E. CLARK. Mr. President, I can vouch for the fact that the subway is in good condition.

The PRESIDENT. I have heard that it is in good condition.

The Round Bale and the New England Spinner.

D. C. Ball, St. Louis, Mo.

Discussed by Messrs. Fred C. MCDUFFIE, D. A. TOMPKINS, JOHN ECCLES, ARTHUR H. GULLIVER, T. F. LEAVITT and O. S. BROWN.

The Paul System of Drying.

HERBERT L. PRATT, Lewiston, Me.

Discussed by Messrs. STEPHEN N. BOURNE, JOHN W. ARRINGTON and CHARLES H. FISH.

The PRESIDENT. We will now listen to the report of the nominating committee, Mr. MCARTHUR, chairman.

Mr. ROBERT MCARTHUR. Mr. President, the nominating committee have performed the duty assigned to them and now beg to make the following report:

For President for the ensuing year, RUSSELL W. EATON, Lewiston, Me.

First Vice-President, FRED C. MCDUFFIE, Boston, Mass.

Second Vice-President, HENRY T. WHITIN, Northbridge, Mass.

Directors, three years. WILLIAM S. SOUTHWORTH, Lowell, Mass.; GEORGE H. HILLS, Fall River, Mass.

The PRESIDENT. You hear the report of your committee. Is it your pleasure that this report be accepted? The ballots will be prepared and collected at one of the sessions tomorrow.

Mr. ALFRED HAWKESWORTH. I move that the report be accepted as read.

The motion was seconded and carried.

The PRESIDENT. There are no other matters upon the programme for this afternoon, unless the Secretary has some notice, and I declare this session adjourned until tomorrow morning at ten o'clock.

THIRD SESSION.

THURSDAY, APRIL 29, 1897, 10 A. M.

Meeting called to order, President LOWE in the chair.

The PRESIDENT. Gentlemen, please come to order. The first business this morning is the election of officers by ballot. I will appoint Mr. THOMAS C. SHELDON and Mr. FREDERICK W. ELY a committee to distribute, collect and count the ballots. This ballot for the election of officers will be participated in by the active members only, the by-laws requiring that the officers be elected by the active members.

The committee proceeded to the discharge of their duties.

The PRESIDENT. The result of this ballot will be announced at the afternoon session, and I think the collecting can be done so quietly that it will not interfere with the taking up of the work at once.

The following papers were read and topical questions discussed:

The Lowell Textile School.

CHRISTOPHER P. BROOKS, Lowell, Mass.

Discussed by Mr. JAMES BUTTERWORTH.

The Manufacture and Use of Spinning Rings.

GEORGE A. DRAPER, Hopedale, Mass.

Read in the absence of the author by Mr. EBEN DRAPER.

The Ring Traveler: Its History and Progress in the Spinning and Twisting of Yarns.

A. CURTIS TINGLEY, Providence, R. I.

Ring Spinning.

ALFRED E. ADAMS, Whitinsville, Mass.

Discussed by Messrs. EDWARD W. THOMAS, CHARLES D. ROBINSON, RUSSELL W. EATON, O. S. BROWN, HENRY T. WHITIN, A. B. MOLE, WILLIAM G. NICHOLS, LOUIS SIMPSON, GEORGE P. GRANT, Jr., FREDERICK I. DANA and ALFRED HAWKESWORTH.

Topical Questions.

On motion, duly seconded, it was voted that the consideration of Topical Question No. 81, "In what particular is the mule as built today, an improvement for spinning fine numbers over those of ten years ago?" be postponed until the next meeting.

82. What is the best way to prevent double yarn on spinning frames where double boss rolls are used?

Discussed by Messrs. STEPHEN A. KNIGHT and GEORGE OTIS DRAPER.

83. What is the best covering for the top rolls used on frames and mules that are to spin various numbers?

Discussed by Messrs. JOHN J. CONNELL and NATHANIEL B. KERR.

84. Metallic drawing rolls: have they come to stay, and how far can they be adopted?

Discussed by Messrs. C. E. W. DOW, GEORGE B. GRANT, Jr., LOUIS SIMPSON, JOSEPH N. DUNHAM, STEPHEN A. KNIGHT, JOHN J. CONNELL and ABEL T. ATHERTON.

85. **Spinning rings: does anyone know how to make them, and how large is it advisable to have them on the different numbers of yarn to be spun?**

No discussion.

On motion, duly seconded, it was voted to postpone until the next meeting the consideration of Topical Question No. 86, "Is it practicable to spin numbers finer than 65s on larger rings than 1½ with spindle running 9,000 revolutions?"

The SECRETARY. I will say to the gentlemen that the paper in the afternoon on "Recent Advances in Weaving," by Mr. NICHOLS of Clinton, will be illustrated by the stereopticon, and the room will be darkened. Though I trust that as far as possible the gentlemen will already be seated at that time, it has been suggested if they can leave the seat next to the aisle vacant it would be convenient for anyone else who might be looking for the seat.

Mr. CHRISTOPHER P. BROOKS. Mr. President and gentlemen, I find that there is one point which I omitted in the paper which I read this morning. As you know, the trustees of the Lowell Textile School have sent an invitation to the members of the Association to visit the school this afternoon or tomorrow morning. After conferring with the President and one or two of the trustees who are members of the Association, we find it will probably be inconvenient for the members to leave the session this afternoon, as there are a number of important papers to be read, and therefore, we have decided to give a general invitation to members of the Association to visit the school at any time when in Lowell. Possibly on some future occasion the meeting of this Association may be held in Lowell, and at that time, of course, there will be an opportunity for all of the members to see the school.

[Noon recess.]

FOURTH SESSION.

THURSDAY, APRIL 29, 1897, 2 P. M.

Meeting called to order, President LOWE in the chair.

The PRESIDENT. If the gentlemen will please come to order we can proceed with some of the routine business.

Mr. MARCELLUS GOULD. Mr. President, I wish to offer the following resolution:

Voted, That the thanks of the New England Cotton Manufacturers' Association be tendered to Messrs. T. F. LEAVITT, of Boston, Mass., M. M. HURLEY of Louisville, Ky., and C. D. GIBSON of West Point, Miss., for their valuable papers on "The Transportation of Cotton from a Railroad Standpoint," and to Mr. CURTIS GUILD, Jr., for his address on "Competition with New England Mills in the Past and Present," both of which have been of great interest to those in attendance at the meeting, and which will be of value to the published "Transactions."

The resolution was seconded and carried.

On motion of Mr. FRANK MESSENGER:

Voted, That the thanks of the New England Cotton Manufacturers' Association be tendered to the trustees of the Lowell Textile School for the invitation to visit this new institution which is so full of promise as a useful adjunct to the cotton manufacturing industry.

The resolution was seconded and carried.

On motion of Mr. ABEL T. ATHERTON:

Voted, That the thanks of the New England Cotton Manufacturers'

Association be tendered to the Transit Commissioners of the city of Boston, for the opportunity to inspect this great engineering work designed and built under their supervision.

The resolution was seconded and carried.

The following papers were read:

Electricity for Mill Purposes.

FRANK P. SHELDON, Providence, R. I.

Discussed by Messrs. LOUIS SIMPSON, FRANK M. MESSENGER, F. B. H. PAINE, ALFRED CLARKE, THEOP. W. WILMARTH and FREDERICK I. DANA.

The PRESIDENT. I have been informed that Mr. HERVEY KENT would like to offer a resolution.

Mr. HERVEY KENT. Mr. President, I have a resolution here which I think will commend itself to the members of the Association. It is as follows:

Resolved, That the Board of Government be requested to take measures to carry into effect the suggestions of the President in relation to special committees.

The PRESIDENT. You hear the resolution of Mr. KENT, which is before you. This refers, I presume, to the division of the work of the Association. The motion is that it be referred to the incoming Board of Government with power. Are you ready for the question?

The resolution was seconded and carried.

The Growth of the Modern Factory System.

ALFRED M. GOODALE, Waltham, Mass.

[Read by title by the Secretary.]

Recent Advances in Weaving.

WILLIAM G. NICHOLS, Clinton, Mass.

Discussed by Messrs. FRANK M. MESSENGER, GEORGE OTIS DRAPER, LOUIS SIMPSON and EBEN S. DRAPER.

Weaving as a Fine Art.

ALFRED HAWKESWORTH, Montreal, Canada.

Picking and Carding.

MARCELLUS GOULD, Norwich, Conn.

The Management of Country Mills.

RUSSELL W. EATON, Brunswick, Me.

A Cotton Spinning Mill at Crefeld, Germany.

Department of State, Washington, D. C.
Hon. PETER V. DEUSTER, U. S. Consul.

[Read by title by the Secretary.]

Early Days of the New England Cotton Manufacturers' Association.

Col. SAMUEL WEBBER, Charlestown, N. H.

On motion, duly seconded, it was voted to postpone until the next meeting the discussion of the remaining topical questions upon the programme, viz.:

87. What is the maximum length to put No. 100s on bobbin?

88. About how many yards ought a warper to run per minute on No. 100?

89. What is the best temperature and humidity for good spinning on fine counts?

90. Do you consider it practical to spool No. 120s yarn with the Wade bobbin holder?

The SECRETARY. I would state that Messrs. Brown & Sharpe of Providence, R. I., have sent an invitation for the members of the Association to visit their establishment at any time.

Any members desiring to obtain further copies of these advance papers, as far as we have a supply on hand, can obtain them here after the session. A number of members have also wished extra specimens of the souvenirs of the meeting, and there are a dozen or more left which will be distributed to any who care to take them for any of their friends or colleagues, members of the Association, who are kept at home.

The PRESIDENT. I would say that samples of roller gin cotton have been left here upon the piano, for the examination of any members who may be interested.

The Secretary will now read the result of the election.

The Secretary read the following:

Whole number of votes,	47
Necessary for a choice,	24
For President RUSSELL W. EATON, Brunswick, Me.,	47
Vice-Presidents, { FRED C. MCDUFFIE. Lawrence, Mass.,	47
Vice-Presidents, { HENRY T. WHITIN, Northbridge, Mass.,	47
Members of the Board of Directors,	
*W. S. SOUTHWORTH, Lowell, Mass.,	47
GEORGE H. HILLS, Fall River, Mass.,	47

THOMAS A. SHELDON,
F. W. ELY,
Committee to distribute, collect and count ballots.

The PRESIDENT. This shows that you have made a choice of and have elected the gentlemen whose names have been read, and I declare them so elected.

This practically co mpletes the thirty-first annual meeting o the Association. I want to thank the members who have furnished papers, and I want to congratulate the members upon the interest and the earnestness with which they have entered into the spirit of the meeting; I think that it shows the thrifty condition of the Association. It has become customary at this time to install, as it were, the newly elected President of the Association, and I would like to call upon Mr. JOHN KILBURN,

*Mr. W. S. SOUTHWORTH declined to serve as Director on account of the demands of his business engagements, and the Board of Government elected Mr. CHARLES H. RICHARDSON of Lowell, Mass., to serve until the next annual meeting in accordance with Article IX. of the By-Laws. *Secretary.*

who is one of our ex-Presidents, to escort Mr. EATON to the chair.

The President-elect, Mr. RUSSELL W. EATON, was accordingly escorted to the platform by Mr. KILBURN, and received the congratulations of the retiring President.

Upon assuming the chair President EATON addressed the Association as follows:

Gentlemen of the Association: — I have to thank you for the honor of the election to this office. The rapid increase in membership, nearly a doubling of numbers in the last three years, presents certain problems for the consideration of the Board of Government which not only require their attention but also will require your active consideration. An Association of five hundred men, prominent in one industry, contains the possibilites of good to that industry only limited by the means for the development of those possibilities. It will be, then, during the year, the work of the Board of Government to attempt to make the work of this Association of the greatest use to the cotton industry, and to that end the Board of Government needs not only the kindly sympathy of the members, but their active co-operation.

I hereby declare the present meeting adjourned without date.

Adjourned.

Attest:

C. J. H. WOODBURY,
Secretary.

TRANSACTIONS.

FIRST SESSION.

CHIPMAN HALL, BOSTON, WEDNESDAY, APRIL 28, 1897.

The meeting was called to order at 11 A. M., President ARTHUR H. LOWE in the chair.

The PRESIDENT. I am sorry that we start this morning with a disappointment. His Excellency Governor WOLCOTT promised conditionally that he would be here this morning to welcome the Association at this meeting, but circumstances over which he had no control prevented him from doing so. I am sure he regrets this disappointment as we do. He is thoroughly interested in the industry and would have been very glad to have welcomed this Association.

We have made a slight change in the programme, which I hope and believe will be agreeable to all the members. The average editor is supposed to know everything and the commercial editor is supposed to know a great deal more. He is supposed to tell us the present and future values of all sorts of commodities, even to gold lace. While he is hidden away in his sanctum he is a very brave man. In this case we have found one who is brave enough to come before this Association and from this platform make some suggestions to our members. I take pleasure in presenting to you General CURTIS GUILD, Jr., of Boston [applause].

COMPETITION WITH NEW ENGLAND COTTON MILLS.

CURTIS GUILD, Jr., Boston, Mass.

(By Invitation of the Board of Government.)

I thank you from my heart for your very kindly greeting and for the high compliment you pay me, though you set an outsider a difficult task when you ask him to tell so keenwitted a class as the cotton manufacturers something of the past, present and future of their own business that they do not know already.

I shall not pretend to do so. Such a wail has, however, recently gone up in certain quarters that the glory of New England cotton manufacturing has departed, on account of competition from the Southern states and from Asia and elsewhere, that you may forgive me if I call your attention to past competition that has been successfully faced by New England cotton mills and present competition that I believe can be successfully faced.

The New England cotton industry began with the settlement of JOHN WINTHROP. Cotton was at that time cultivated not in the United States, but in the West Indies and very largely in the Barbadoes, till it gave way slowly to the more prosperous crop of sugar.

The manifests of the very first vessels built here in New England and that sailed from New England harbors bear witness to this traffic. The fibre was then called not "cotton" but "cotton woole."

The Great and General Court of the province of Massachusetts Bay in 1640 ordered that boys and girls be taught to spin yarn of "cotton wool."

The "Trial" built in 1642 at Boston, the first ship to engage in international commerce that was built in Massachusetts Bay, on

her return voyage from the Azores via the West Indies brought cotton as part of her cargo. We find cotton on the manifest of a Connecticut vessel as early as 1643.

The chain cables and paving stones that fill up some cotton bales today had their prototypes in the old days of spinning wheels and hand-looms. One JOHN HULL, a Puritan inhabitant of Boston, whose letter book has been published by the American Antiquarian Society, was sadly plagued and made to pay roundly because of the "fowle" stuff with which the wily West Indian cotton grower had stuffed the center of the bales, which JOHN HULL, honest man, had shipped into the interior of Massachusetts in exchange for provisions. The rivalry between the Provinces in the manufacture of cotton was quite marked, even in Colonial days. Massachusetts once (in 1777) actually forbade the shipment of cotton to New Hampshire. The value of these cargoes, all through the Colonial period makes us open our eyes. The price of cotton cloth was something appalling before the invention of the cotton gin. Raw cotton cost three shillings and eight pence a pound in 1779, and cotton cloth in proportion. Raw cotton cost more 100 years ago than the finest scoured wool does today. The story of the foundation of the first cotton mill following close upon the invention of COMPTON and ARKWRIGHT is familiar. We know of the Worcester attempt to spin and weave cotton in 1780, the experiments of ORR and the BARRS at Bridgewater and of ANTHONY, PECK DEXTER and ALEXANDER at Providence.

Pawtucket has not yet forgotten the SLATER centenary, his first manufacture of cotton in 1790 and the first cotton factory in 1793. The first establishment of SLATER had two spinning frames and 72 spindles. The starting of those two spinning frames in Rhode Island and the sowing of the first cotton seeds in the Southern States in 1785 mark the beginning of an industry in which the United States now leads the world. The venture of Slater, however, was not at first a great success. "Calico," as everybody knows, is derived from "Calicut," probably the most ancient seat of cotton manufacture in the world. Everybody

may not know, however, that the word "calico" was applied originally to unbleached cotton cloth as well as to prints. Calcutta was the great source of supply of cottons in the early part of this century. In 1807 and 1808 Calcutta sent us 53,000,000 yards of cotton cloth, mostly coarse unbleached goods, worth $12,000,000.

This was the competition that SLATER faced, and nearly twenty years after his factory was started there were but 4,000 spindles in operation in and about Pawtucket.

In 1810, according to the Gallatin statistics of the Secretary of the Treasury, the cotton factories of the United States turned out but 856,645 yards of cloth, and the annual product of the whole industry, hand-loom and factory, was but 16,581,299 yards, a mere fraction of the imports from Calcutta alone.

Such was the industry in the "good old days" when New England believed in free trade, when shipping was her industry and the ocean her farm. Foreign commerce was Boston's great industry, manufacturing was in its infancy and JEFFERSON'S embargo fell upon this city like a destroying blight, the commercial distress that followed it coming near to driving Massachusetts out of the Union.

JEFFERSON'S embargo was, however, a blessing in disguise. The War of 1812 taught us the danger of utter dependence upon foreign nations for the commonest necessities of life. The War of 1812 gave us something more than naval victories. It gave us the textile industries of New England.

FRANCIS CABOT LOWELL is the father of the modern New England cotton factory. He it was who, with PATRICK JACKSON and PAUL MOODY, re-invented and brought into common use the power loom. When he predicted that within fifty years the price of coarse, unbleached cotton cloth would be reduced to eight cents a yard he was jeered at as a madman. Eighty years have brought the price down not merely to eight cents, but as we know to our sorrow, to two and a half cents.

The first establishment at Waltham in 1814 had 231 looms and 8,064 spindles with a yearly capacity of 2,000,000 yards,

more than the entire factory product of the country up to that date. The protection afforded by the War of 1812 was supplemented by the protection afforded by the law of 1816 and the city of Lowell still stands as a monument to the citizens of Massachusetts to whose leadership not merely in invention but in business management and in the framing of legislation, New England and the United States more than anything else owes her mighty industry of cotton manufacturing.

From SLATER'S two spinning frames in Pawtucket, from LOWELL'S factory in Waltham, that industry has grown to a total of 18,753,935 spindles in 1896. In the census year the United States had invested in cotton industries $354,000,000, of which $243,000,000 was invested in New England.

The competition of the South with our New England cotton mills is no new thing. It has existed for more than half a generation. Ever since 1880 journalists and orators have exhausted the vocabulary on the progress and prospects of that section. Even the dry pages of the United States Census have blossomed into rhetorical flower on the subject. The addition of some thousands of spindles to the Whitman mills in southeastern Massachusetts occasions little remark and a small paragraph in a local paper. The building of an infinitely smaller mill at some remote town in the Southern States is telegraphed when it is begun, telegraphed when it is completed, telegraphed when it sells its first yard of goods, to the remotest corner of the United States; and the business of the South in that way is magnified and exaggerated at the expense of New England.

The growth of cotton manufacturing in the South is, however, neither to be depreciated nor despised. It is natural, it is encouraging. It is a most healthy sign of the adoption not only of modern enterprise, but of modern ideas, in a section that until a too recent date, has been oppressed by a mediæval social system.

Every bar that drops from a Southern forge, every thread that leaps from a Southern spindle, is a link in the community of interests that is to bind jealous sections into a harmonious

nation where the prosperity of each is recognized as a benefit to all.

It is in no spirit of hostility that I venture to call attention to the fact that the eulogists of the South seem to have closed their eyes to the growth of cotton manufacturing in New England. Yet that growth in the decade of the South's greatest gain (1880-1890) is double the much vaunted gain in the Southern States. In that decade the Southern States showed all together a gain of a million spindles (a tremendous gain). Massachusetts alone, however, in that same decade showed a gain of 1,600,000 spindles — 60 per cent. more than in the whole of the South put together. The gain of New England (2,204,068 spindles) was more than double the combined gain in all the Southern States, and this in spite of the fact that the average weekly wages paid in New England cotton mills were $2.33 more per week than in the South.

We need not, however, go as far back as the United States Census. Let us take the very latest trade statistics available, the admirable canvass of the country by Dockham's Textile Directory, giving a comparison for the years 1894–1896 inclusive.

Now 1894 and 1896 certainly were not prosperous for the Northern States. The whole country economized and neglected the finer for the coarser fabrics. If there were ever two years when the natural course of events favored the South at the expense of the North, they are the two years 1895 and 1896. Yet in spite of that fact, between December, 1894, and December, 1896, according to DOCKHAM, the gain in cotton spindles in Massachusetts (630,192) was nearly double the gain in any other State in the Union; nearly twice the gain in South Carolina; nearly three times the gain in North Carolina; four times the gain in Georgia, and more than ten times the gain in Alabama or any other State.

In 1896 there were 7,790,642 cotton spindles in Massachusetts; more than three and one-half times as many as those in any other State in the Union.

There are more than twice as many spindles in Massachusetts

than the combined plant of Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas. Missouri, Kentucky and Tennesee.

Rhode Island, though second, is far behind Massachusetts; Rhode Island has 2,104,069 spindles. New Hampshire comes third with 1,308,802 spindles.

Of the 18,753,935 spindles in the country, 13,372,328 are in New England. Today New England holds 70 per cent. and Massachusetts 42 per cent. of all the cotton spindles in the country.

In approaching the study of cotton manufacturing it is well to remember that Massachusetts has not lost, and, as the figures of increase show, is not losing her honored place, not as a mere contestant, but as the recognized leader among the sisterhood of States of the American Union.

It is, however, also an undeniable fact that certain branches of cotton manufacture are moving South, and that as great as has been our progress in spite of competition, it might be made still greater were it not for this same southern competition. A number of mills have, as we all know, established branches in the South rather than in New England, and one mill, the Lawrence Manufacturing Co., made a sensation last year in manufacturing circles by returning half its capital to its shareholders and abandoning its weaving plant, rather than change from a time worn staple, made unprofitable by southern competition, to some other product that is not unprofitable.

The advantage which the South possesses in cheaper coal is in part offset by the superior water power of New England. It is true that in the manufacture of coarse goods the Southern mill can save at least half a cent a pound on goods by using the cotton that grows at its door. When, however, the fine cottons from Arkansas and especially the imported Egyptian cottons are used, the through rates to New England mills, especially to New England mills on tide water, are in many cases even less than the local freight rates to the foothills of the

Appalachians in the South, where cotton manufacturing has been most successful. We also have an advantage at present in economy of selling expenses and the lower rates of interest.

A more serious factor than cheap coal and cotton in the competition as at present conducted is local taxation. Southern cotton mills in many cases are exempted from taxation from ten, fifteen and twenty years while in Massachusetts not only are the mills taxed to the very extent of the law, but one Massachusetts city, at least, has had to be forced by the courts to abandon attempts to overtax the mills unfortunate enough to be situated within its limits.

We are handicapped by the lower wages of the South. The average weekly wages of a woman in a Georgia cotton mill in 1890 were $4.55. In Massachusetts they were $5.89. Today our cotton operatives are paid forty cents a cut against twenty cents in Georgia. Southern labor is not unintelligent labor. It is good labor, and the scarcity of money makes any employment paid for in cash, not in articles of barter, highly popular. The mill owner in the South is not regarded as an enemy but as a benefactor.

Not only are we handicapped by the difference in wages of labor, but by difference in the laws regulating labor. South of Mason and Dixon's line laws prohibiting the labor of children under the age of fourteen are either a dead letter or they do not exist.

Neither in the Southern States is there any material restriction of the hours of labor. It is cheap labor and long hours rather than cheap cotton that is draining capital from Massachusetts to Georgia. Georgia mills are running 78 hours a week against 58 in Massachusetts.

The Bay State has taken the lead in ameliorating the condition of labor, but that lead has not been followed by other States. Our hours of labor are not only shorter than those of the South, they are shorter than those of any other State. A Rhode Island mill of two thousand looms can produce twenty thousand yards per week, or a million yards a year, more of

print cloth than one in Massachusetts, as the difference between fifty-eight and sixty hours per week.

The New York and Everett Mills, working at the same time and under the same management, making similar goods on similar machinery, one in Maine and the other in Massachusetts, offered a short time since a most striking example of the disadvantages under which our manufacturers labor. The Massachusetts mill, running ten hours a day, was forced into reorganization. The Maine mill, running eleven hours and a half continued to pay dividends.

Now, we cannot grow cotton in New England; neither can we make local taxation of mill property uniform; neither can we force the southern cotton operative to strike for higher wages if he is content to work for his present remuneration.

There are two things, however, that legislation can accomplish, it can make a national regulation of the age of labor; it can make a national regulation of the hours of labor.

Such legislation has long been demanded by the labor unions; it has even received the endorsement of the National Association of Wool Manufacturers.

It might be necessary to amend the Constitution to do this, but the Constitution has been amended before. If a law for the national regulation of bankruptcy is possible, why not a law for the national regulation of the conditions of labor, that prosperity in one part of the country may not be obtained by disaster in another?

Such legislation naturally should be directed not to pulling the labor of Massachusetts down to the conditions of that in South Carolina, but rather to raising the labor of South Carolina to the condition of the labor of Massachusetts.

If New England can hold her own (and she is more than holding her own in the industry as a whole), if New England can hold her own in spite of all the disadvantages with which she contends today, who shall measure her progress in the industry when we have, as the framers of the Constitution intended, free play and fair play, an absolute equality of all but natural condi-

tions throughout the length and breadth of the American Union?

It may be said of the South that even if its success should drive New England from the field in the manufacture of cotton, the industry would still be American, just as much a part of our National wealth and resources as though it remained in New England. Another competition is beginning to attract more and more attention, and that is foreign competition, more marked in 1895 I think I may say, than ever before.

In 1895, the calendar year, we imported manufactures of cotton to the value of $35,000,000. In 1892, the last highly prosperous year, we imported cotton goods to the value of $30,147,720. The number of square yards of cloths alone imported was 50,307,478 in 1895, and 37,459,659 in 1892. In 1896, the year of acute depression and bankrupt stocks our own low prices cut down the imports again to $30,000,000, but 1895 shows the movement in a more nearly normal year.

The greater part of these cotton goods came from England and Germany. A new competing nation has, however, appeared and though at present it is but the traditional cloud no bigger than a man's hand, it cannot be ignored.

We imported in 1895 cotton goods to the value of $136,000 from Japan. Our exports of cottons to Japan in the same year were valued at $56,197, a little over a third of the imports.

The first Japanese cotton mill was built in Kagoshima in 1863 by the greatest of the last generation of feudal princes, SHIMAZU HARIHISA. In 1867 the second mill was built at Oji, and these two were the only mills in the country till 1870. Then the Japanese government took the matter in hand. It is only in recent years, however, that the industry has fairly flourished. There are more cotton spindles in Japan than in New York, or in either of the Carolinas or even in Maine or in Connecticut. Today there are 1,147,045, with more being installed every day. The number has doubled in two years. Men are paid 13 cents, women 6½ cents a day. The average profit per spindle per annum ranged from $2.96 in the first half to $3.78 in the last

half, according to Mr. ROBERT P. PORTER'S report. The dividends range from 15 to 35 per cent. per annum.

Japanese cotton mills are consuming now 234,000,000 pounds of cotton a year. Already the industry has far outstripped the Japanese cotton crop, which by the way is decreasing, and Japan now looks not only to China and Japan, but to the United States for supplies. Japan's imports of cotton have increased tenfold in ten years. In 1895, the country imported 190,095,543 pounds, of which 170,733,555 pounds were from China and India, and but 15,894,852 pounds from the United States. This last year we have exported over 20,000,000 pounds to Japan.

The new Japanese trans-Pacific subsidized steamships were sent out largely in view of this traffic, which is increasing every year. Japan's imports of cottons from England have been cut down more than one-half and she comes to us, as does England, for her raw cotton and competes with us on the manufactured products in the markets of the world.

Not only is there a competition springing up in Japan, but China herself is entering the field. By the Shimonoseki treaty Japan broke down the barriers that have hitherto fenced around cotton manufacturing in China. Since that war for the first time the hated "foreign devils" have been given the right to build and operate factories in China. There were already one or two under native management. The first mill under foreign direction was started at Shanghai in May, 1895, by the British firm of Jardine, Matheson & Co. There are to be 28,000 spindles in this mill. Since then two other mills, one with 28,000 spindles and another of 40,000 spindles have been projected; the latter under American management. The machinery is imported from England. Consul JERNIGAN states that in a short time the China cotton mills in operation under native and foreign management will have a plant of 265,200 spindles.

Even Chinese machinists, skilled ones, cost but twenty-two cents a day, the ordinary cotton operative's wages are barely half this pittance, and the prospects are excellent for dividends as inflated as those paid by the cotton factories of Japan.

I suppose every one has read the highly interesting interview that was printed from the manager of the Peninsula & Oriental Steamship Company, in which he stated that Chinese mechanics are becoming so skilful that the company expect shortly to have a large part of their repairs done in Asia instead of in the British Isles.

It is commonplace to say that the Japanese war is likely to be almost more far-reaching in its results than the war for the American Union. It has not only added another to the great nations of the world, it has precipitated a vast economic and social strife of which we today see the faint beginnings.

It is not a war between sections; it is not a war between nations; it is a war between races. It is a revival in the much more uncertain field of commerce of the struggle formerly waged in the battle-field between the Aryan and the Turanian races. The American mill operative faces today his Chinese and Japanese rivals as his remote forbears faced theirs.

The contest is not with spear, and bow, and sabre as it was when ATTILA led his Huns to the pillage of Europe, when GENGHIS KHAN founded a Tartar Kingdom in Russia; when SALADIN and his Saracens drove the Crusaders from the tomb of Christ; and when the Sultan Mahomet tore down the cross to make room for the crescent in the churches of Constantinople.

The Tartar origin of the Hungarians is well nigh obliterated; there are no Moslem warriors riding against the people of RODERIC and the Cid. Russia in her turn is conquering Tartary, and the Turk no longer besieges Vienna.

The physical superiority of the European has triumphed over the inferiority of the Asiatic.

He fights us today, however, with that very inferiority. We are to compete not with slender-armed and stunted warriors, but with slender-armed and stunted laborers; labor that is content to sleep in a dry-goods box, to whom meat is a curiosity, and whose mind seeks no cultivation or development if only the fingers be sufficiently skilful to earn the modicum of rice that suffices for food and the strip of cotton that suffices for clothing.

These dangers at present are exceedingly remote, but every year brings them nearer. We can, of course, protect our own markets from the competing products of Asiatic labor as we have protected our labor from the competition of the Asiatic on American soil.

We may ultimately lose our Chinese market for American cottons, but our own market we way save if we will.

The cotton industry of New England depends primarily upon the pluck and energy and self-reliance of the New Englander. It depends, also, as every industry depends, upon the conditions, natural and artificial, under which that industry is carried on. We have lost our pig iron industry through perfectly natural causes, but if we make less pig iron we make more watch springs.

If we have lost the former industry we have gained immensely in other metal and in other iron and steel industries and in the iron and steel industry of Massachusetts, notwithstanding what is said to the contrary, has not gone behind; it has steadily gone ahead, because the men interested in it have known how to change their product and adapt it to changed conditions.

We cannot grow cotton in New England. We cannot force the Georgia cracker to strike for Massachusetts wages; but we can compete in those branches of the industry where material counts for little and brains count for everything. We may not be able to compete with the South on coarse brown cottons, but we can compete with the South on ginghams and prints and white goods. We faced the competition of Asia in the days of hand looms, in the days when Calcutta sent us goods, at the very outset of the New England cotton manufacturing industries when Asia absolutely controlled our markets. We beat Asia because we invented machinery faster than she did and because we put a protective tariff on the products of cheaper foreign labor. The course that was successful before shall be successful again, while the increasing competition from the South is to be recognized and met, if necessary, by a change of product. It is, however, centainly no time for despondency when New England

is increasing her ascendency and when New England print works get new fashions on the American market a season before the same effects are sent here from the works of France.

There is a legend in Bristol county that when General WASHINGTON visited New England and condoled with General COBB of Taunton on the stony soil and bleak winds of Massachusetts, his old staff officer answered, "Nevertheless we do not fear competition, Sir; not even the competition of Virginia, as long as New England raises men."

It was in the same spirit of self-reliance that Governor GREENHALGE said to his audience at the Atlanta Exposition: "You may well boast of your advance in cotton manufacture. We of Massachusetts do not grudge it to you. If you manufacture the coarser goods, we will manufacture the fine; drive us from both fine and coarse and you must still send us your uncolored cloth to be bleached and dyed. Drive us from the bleaching and the dying and you must still come to us for the machinery to run your mills. Drive us from machine building, and if we can send you nothing else, you must still send to us for Yankee boys with Yankee brains to officer your industries."

That has been the history of New England. Let one leader fall and the gap is filled by another; cripple one industry, and another takes its place. New England energy, New England honesty still flourish along our stony hillsides and countervail our lack of advantage in soil and climate.

The discovery of petroleum and the gradual extinction of the great herds of whales might have been expected to have delivered a death blow to New Bedford. The city, in spite of recent unhappy disclosures is more prosperous than ever, not as an oil centre, but as the home of factories of shoes and cotton. The East India trade of Salem has departed, but its tanneries and cotton mills employ a larger population than ever gathered about the wharves when the ancient town selected a Chinaman for its coat of arms to signify the importance of its tea trades The shores of the Mystic no longer ring with the hammers of the shipbuilder, but the ships that first floated on those water.

were no better known than the rubber manufactures made by the children of those shipwrights and sent to every corner of the world.

Mere natural advantages do not alone ensure successful competition. Our own Revolution taught our grandsires that lesson. It is not the weapon merely that wins the battle, it is the man behind the gun.

The artificial conditions can be regulated by the making of laws which in turn are the results of the action or of the inaction of the whole community. The wailing cry of the slovenly citizen for a divorce of politics and business is as absurd as it is impossible. Politics is the selection of law-makers and law administrators, and a selection of law-makers to make regulations to regulate your business is just as much a part of your business as the keeping of your books. Law is necessary for civilization and every form of business must be conducted according to law. Business cannot exist without it. The business man who refuses to do his part toward making good laws, toward making good regulations for his own business is worse than foolish; he is consciously or unconsciously false to the first principles of popular government.

If town and city and State and national governments contain weak or venal men who hamper and cripple local and national development, whose fault is it?

More than on any other class does the blame rest on the shoulders of that species of business man who neglects the plain daily duties of the American citizen, and who too often tries to buy legislation for his private and personal benefit. Public opinion is quick to condemn the politician who takes the bribe. How often does it ostracize the railroad president or the monopoly organizer that offers it? The boodle alderman goes to Sing Sing, but the great corruptor of legislative bodies passes from our midst in the full odor of sanctity.

If half the men who in club and counting room carp and criticize the ill work that they themselves neglect, if even half of these men would put their shoulders to the wheel of public

affairs at primary, and caucus, and convention, there would be no legislation deserving such criticism.

I believe that the business men of the country are awakening to a sense of their duty as citizens. When the business men of Kentucky, and Maryland, and Missouri, and Alabama, and Dakota rouse themselves, as they have, to fight for honest money, not at the club house, but at the party convention and the national election; when in the ring-ridden cities decent men of all parties unite as they are uniting to fight, and to fight not a single battle but a thirty years war if need be against the debauchery of public office; we can at least look forward with hope not only for our industries, but for our country as the truth is borne in upon every honest man that upon his personal devotion, upon his effective exhibition of public spirit depends not only the prosperity of his own industry, but the honor and integrity and progress of the United States of America.

SECOND SESSION.

WEDNESDAY, APRIL 28, 1897, 2 P. M.

The Association met in Chipman Hall, President LOWE in the chair.

The PRESIDENT. I would like to have the gentlemen come forward as much as possible and get as close as convenient. It is a good thing to touch elbows.

The first paper upon our programme for this afternoon's session is upon the subject, "The Handling and Transportation of Cotton." I do not think we can overestimate the importance of this. The first paper will be read by Mr. STEPHEN A. KNIGHT of Providence, R. I. [Applause.]

THE HANDLING AND TRANSPORTATION OF COTTON.

STEPHEN A. KNIGHT, Providence, R. I.

Can the New England manufacturers do anything to improve the present methods for its transportation?

The subject before the meeting was presented to the Board of Government by myself. At the time of its presentation I did not expect to write a paper or to say much about it; my object was to bring it before this Association for discussion. It seems to me a matter of vital importance to the manufacturers of New England, and it is my hope that some good may come out of its discussion here.

I have asked, through your Board of Government, for papers on this topic from men of ability, sound judgment and experience, and expect that these papers will be read by those gentlemen at this meeting, therefore my remarks will be very brief.

There is no one article of merchandise, within my knowledge, that is so recklessly handled as cotton in the bale, as the bulk of it comes to us to-day. It is subject to all manner of abuse and robbery from the time it leaves the cotton field until it reaches the consumer. Owing to its ragged condition and the free use of hooks, it is often the case that the man or men who have the floor or ground pickings (as I believe to be common at shipping and transfer stations) get more out of the bale than from the sweepings.

In these days of close competition, especially with the mills of the Southern States, economy in handling and transporting cotton is of even greater importance than it was in the past. They (the southern manufacturers) get not only the benefit of cheaper labor and longer hours, but the cotton is landed at their

mills in a manner very superior to that in which it is delivered to us. They are able to get full weight, free from the wet and mud, and many other losses incident to the present method of transportation that we of the North are compelled to pay for.

It is a well known fact that to have cotton in its best spinning condition it is as necessary that it should be well seasoned as it is that lumber should be seasoned to fit it for the cabinet-maker's use, and this seasoning should be done in the baled and housed cotton.

It is not at all an uncommon thing for cotton, when at its transfer station, for lack of cars or some other reason, to be unloaded and left on the uncovered platform, or still worse, in the mud by the side of the railroad track, exposed to rain and sunshine, until the outside if not the whole bale is much injured. The spinner gets less pounds of yarn and of a weaker quality in consequence.

Then again, when the cars are furnished and the cotton is reloaded, it is found in many cases that the second car will not hold as many bales as the first car discharged, so that one, two or more bales are left behind, and the buyer, even if he ever gets them, waits a long time for these bales. Sometimes he gets his own bale, and quite often he gets someone else's. It may be better, and what is more generally the case, it may be poorer. It may be heavier and it may be lighter than his own. He really feels lucky if he gets the missing bale at all, and so in the end accepts whatever is offered him.

The question before us today is, "can there be a remedy found for this abuse?" I believe there can, and that remedy is "through transportation." If we set ourselves resolutely, persistently and consistently about it, we can attain this end.

Before alluding to the manner in which I believe the cotton should be handled by the railroads, I wish to briefly state how it should be handled prior to this.

In the first place we should insist that there be as little and as light covering put upon the bale as is consistent in order to protect the cotton. We should insist that the bale be covered

completely, so that there need be no chance for robbery or waste while in transit from press to cars. In the present method, as is well known, very many of the bales come to us covered with patches, or two thicknesses of heavy bagging that seem to us to be entirely uncalled for, and which add largely to the tare. I have stood by the side of the press where the cotton was being compressed and witnessed the shameful practice many times that was being carried on there.

Other gentlemen of this Association were with me at a compress where stacks of second-hand bagging were on either side of the press, and when the hoops were cut large pieces of this bagging were added to each bale, for no other apparent purpose than to increase the weight, and was as often put on places where the covering was sound as over holes or ragged places.

And now as to the manner in which I believe that it should be handled by the railroads. They should not accept a bale unless it is in perfect condition, then it should be immediately loaded into cars, the cars sealed with the shipper's seal, and the cotton should not be disturbed again until landed at its final destination, with the seal unbroken; then if the condition of the cotton is not up in every respect we know who is at fault.

It may be urged that the railroads have not a sufficient number of cars to let them come all the way through. Mr. President, railroad officials are men of intelligence, and it has been my experience that they are ever ready and willing to adapt themselves (when consistent) to the best interests of their patrons, and when they are convinced that the transferring of cotton from one car to another brings great loss and inconvenience to the purchaser, they will, without doubt, furnish the proper facilities for bringing the cotton through without change. But should any road, after having the facts fairly presented to them, refuse our request, we should insist that a road not equipped with cars enough to send our cotton to us without transferring from one car to another, and is not willing to procure them, is not the road over which we are willing to ship our cotton. Give the freight, so far as may be, to the parties who

give us the best service, and a large part of the trouble will, in my opinion, be speedily remedied.

There was a time when there were no railroads in the South, and only until the time came when the business would seem to justify the outlay, were they constructed. So in regard to additional cars, when the necessity is apparent then the cars will be furnished. My remarks, thus far, apply to the square or common method of baling.

Some two or three years ago this Association raised and agitated the question "Tare on Cotton," a matter very closely allied to the subject before us. Though there was not as much done in that line as there might and ought to have been done, it has had a marked effect. Efforts are now being made, and with considerable success, to bale our cotton with very much less weight of bagging, no hoops at all, and but little dirt or sand. I refer to the cylindrical bale.

I was informed by JEROME HILL, president of the Jerome Hill Cotton Co. of St. Louis, that a car holding fifty bales of the old method of baling, would hold one hundred and fifty bales of four hundred and twenty pounds each, of the cylindrical form.

If this method of baling proves to be a success, and is generally adopted, it will solve, in a large measure, the question of cars for through transportation, as it will readily be seen that the cars that now come part way through and transfer can afford to come all the way through. In the meantime, while this is being brought about, perhaps the southern roads can make arrangements with the northern roads for some of their cars, or adopt any other method, if more satisfactory to them, that would serve our purpose.

As the cylindrical bale bids fair of itself to solve the question of "through transportation," it may not be out of place for me to say a few words regarding it. I ordered a small invoice of this cotton for the express purpose of ascertaining its merits and demerits. Let me say right here that I found much to commend and little to find fault with. The cotton arrived in prime

condition, was carefully re-weighed and found to fully hold out in weight. Owing to some of the bales weighing less than four hundred pounds (the lightest weighing three hundred and eighty-five, while the heaviest weighed four hundred and twenty-six), the average weight of the invoice was four hundred and eleven pounds per bale. The bales were covered with two widths of burlap, each thirty-six inches wide, and lapping some six inches in the centre. The average weight of this burlap was three and thirty-five one-hundredths of a pound to the bale, or about eighty-two one-hundredths of one per cent. of the total weight. Had the covering consisted of burlap sixty-six inches wide, which would have answered the purpose equally as well, the weight would have been only three and seven one hundredths of a pound, or an average of about three-quarters of one per cent.

When we consider that the tare on the old style bale is about twenty-five pounds, or about five per cent. of its weight, it seems enough to set the ordinary man to thinking.

The bale unrolled perfectly until within about two inches of the core, when it had to have a little help. This trifling difficulty, however, can be easily overcome. The cotton appeared to be very free from sand and large seeds which are so frequently found in the square bale. When fed into the opener it seemed to work easier, consuming less power, and upon the whole was quite satisfactory. That was my experience with the "round bale." Other manufacturers who have used the cylindrical bale have had a similar experience, and practically tell the same story.

I will quote from PAUL J. MARRS, treasurer of the Henderson Cotton Mills, Henderson, Ky. He says: "The cotton was received in excellent condition, and no loss whatever. I was careful in weighing and ascertaining the actual tare, and found it to be an average of three and one-half pounds to the bale. In using the cotton it unrolled with ease and smoothness perfectly to the core. With little expense spinners can arrange to unroll several of these bales at one time by using machinery in such a

manner as could best be arranged in their mixing room, and would save considerable expense over the old way of mixing." I might quote others but this will suffice.

The bale is four feet long, and two feet in diameter. It can readily be seen, therefore, that a box car forty feet long by eight feet and four inches wide, by eight feet and eight inches high (the common dimensions we believe), would hold one hundred and sixty bales, if closely packed, or one hundred and fifty-two if packed with ordinary care. We therefore think it consistent to believe that the railroads could afford to transport cotton baled in this manner, for a considerable less price per hundred weight, than the old rates.

Perhaps I can do no better in closing than to quote from an article on the "cylindrical bale," in the April number of the *Wisconsin Engineer:* "The heavy jute bagging and steel ties which cost the former from seventy-five cents to one dollar per bale, are replaced by a cheap covering costing less than twenty cents. The compress and screwing charges of one dollar per bale are saved, and the cost of insurance greatly reduced. The insurance people have made a great many attempts to burn this bale, large quantities of wood being piled around it, and the whole saturated with coal oil. When the fire burnt out the bale was rolled out practically uninjured, only the outer layers being scorched. This induced them to make the rate of insurance one-half of that on the other bales, and no doubt it will be still lower.

"Taking into consideration the various economics and the much better condition of the cotton when put in the cylindrical bale, it is estimated that at least forty millions of dollars annually will be saved over the present method, and as the progressive methods of the nineteenth century have but just begun to invade this industry, after nearly a century of stagnation, it is fair to presume that other improvements will be made, especially in the ginning of cotton, that will greatly enhance even this enormous saving."

I have thus briefly alluded to this bale on account of the im-

portant bearing it has, in my opinion, upon the question before us. Many more things might be said in its favor, but I will not anticipate.

I note with pleasure that Mr. D. C. BALL of St. Louis, is to read a paper entitled, "The Round Bale and the New England Spinner," when, doubtless, the subject will be treated in a thorough and interesting manner.

A word more and I have done. Enterprising men and inventors at the South have, by the expenditure of much money and by weeks and months of persistent effort, succeeded in producing a cotton bale compact, of a shape that renders it very easy to handle, and in short a wonderful improvement upon the old bale. These men, these inventors, have done and are doing their part. Now if the railroad people will do their part, strive to improve upon the old method of transportation and land our cotton at our manufactories in the condition it is when first baled, then the principal object of this paper will have been accomplished.

The PRESIDENT. Before taking up the other paper, if there are any questions that any of the members would like to ask Mr. KNIGHT, I think he will be very glad indeed to answer.

Mr. LOUIS SIMPSON. I would like to ask Mr. KNIGHT if in his experience with the round bale he found any trouble in the centre of the bale. I have heard rumors that the cotton in the centre of the round bale came out so hard that they had to take axes to break it apart. The round bale is a very important thing to all manufacturers, and if Mr. KNIGHT can tell us what he has noticed about this matter, his opinion will be very valuable.

Mr. STEPHEN A. KNIGHT. I would say in regard to that matter of the invoice of cotton that I received, I went to the mill myself and was present at the opening of each bale, and as I have remarked in my paper here, it unrolled perfectly up to within about two to two and a half inches of the core. There was no core and no foundation except just a few thicknesses of thin paper that were evidently put around the spindle before the cotton was wound. About two inches of it was not so easily unrolled, though there was but very little difficulty with that. We just took our fingers and helped to unroll it. There was practically no particular trouble about that. My impression at the time was that if that could have been rolled upon a mailing tube of sufficient thickness and weight, there would have been no difficulty in unrolling to the very end. While we were unrolling the first part of the bale down to the size that I speak of, we simply suspended this bale in a rude manner, not having anything provided for it; we just took an endless chain fall, ran an arbor through the bale, and put a spreader in the upper part of the chain which was attached to the fall, so that there was no friction against the end of the bale, and unrolled the bale. I think we turned the bale at the rate of sixty revolutions per minute. One end of the hole in the bale is considerably larger than the other. I judge from that that the spindle on which it is rolled is a tapering spindle. The rod which I ran through the bale was a ⅞-inch steel rod, with one end pointed, and this was inserted at the centre of the large end of the hole. It did not enter as well as it would if there had been a tube or some such arrangement, but it seemed to me that that was so trivial a matter that it could be easily overcome. I would say in regard to this that when this cotton came to me Mr. HILL wrote me that this was an extreme test; that it was from the smallest steam saw gins, I think he said, that there were in the South, and it could be readily seen that the lighter the sliver the less likely the bale would be to unroll. We unrolled those bales as I said, at the rate of sixty revolutions per minute, and the cotton unrolled perfectly until perhaps a couple of inches of the core, and then it had to have a little help from us.

Mr. STEPHEN N. BOURNE. I would like to ask Mr. KNIGHT in what condition the cotton was which was next to the spindle where they begin winding? I have had a couple of hundred bales of this cotton. I did not notice every one of them, but I saw a few of them, and my experience is that what came around the spindle—of course there were not very many pounds—but what came around that spindle is injured; there is no strength to it.

Mr. STEPHEN A. KNIGHT. In the cotton that I received there had evidently been wound round the spindle before the cotton was put on, some three or four thicknesses of common straw paper, so that the cotton did not come in direct contact with the spindle, and I should say that that paper had been coated with soapstone previous to its being put on the spindle, so that the cotton did not come in direct contact with the spindle, for the express purpose, I imagine, of helping them extract the spindle. But my idea would be, if something better was not suggested, simply to put a mailing tube, a paper core on the spindle, to go inside of the bale. It does not require a very heavy one. I had one made simply for the purpose of ascertaining how much weight it would bear, a tube which measured about 1½ or 1¼ inches in the clear and perhaps from $\frac{1}{16}$ to ⅛ of an inch in thickness, and I found that you could roll upon that with very heavy pressure without its giving at all. If that was inside the bale there would be no trouble in introducing the spindle and no trouble, I think, in the cotton unrolling. I accounted for the trouble in this cotton from the fact that the aperature that their spindle occupied closed up as it was taken out and the cotton contracted. I should not think there were more than six or eight pounds of the cotton that did not unroll, but even in that part of it the cotton itself was all in perfect condition; there was no trouble whatever with it. This tube which I made weighed a quarter of an ounce to the inch; in other words, for a bale of cotton forty-eight inches long, the tube would weigh three-quarters of a pound and would cost, I suppose, from four to five cents. I really think that would

overcome the whole difficulty, from the little experiment I made with the tube. I took the tube and put it on the spindle and wound around that in contact with it No. 14 drum banding, till I had wound it up to nearly a foot in diameter, and then pulled the spindle out to see what the effect would be; it did not seem to close at all.

Mr. STEPHEN N. BOURNE. This paper, no doubt, is an improvement on what I had. Was that covering of cotton or burlap or hemp burlap?

Mr. STEPHEN A. KNIGHT. It was jute burlap, about nine ounces, I think, to the square yard.

Mr. STEPHEN N. BOURNE. Part of ours came with cotton covering and part with jute. But where they put the jute on I noticed these fellows who put up the round bale are like all the rest of us — they want to cut the corners and make the best of it. There is twice the tare where they put the burlap on.

Mr. STEPHEN A. KNIGHT. If they do that it is our fault. We have no business to accept it in that way.

Mr. STEPHEN N. BOURNE. What are you going to do after you get it?

Mr. LOUIS SIMPSON. Kick!

Mr. STEPHEN N. BOURNE. I think the best thing for them to do now is to just not have any tare — sell it net. That is what you want to do.

Mr. STEPHEN A. KNIGHT. That is precisely what this Board had anticipated bringing before the Association when we get the other end of the dog's tail cut off. You have heard of the school teacher who had a nice little dog and it had too much tail, and some of her friends suggested that she have it cut off. She said, "What, cut it all off at one time? I will never consent to that — poor thing! You can take off one joint, and

when that gets well you can take off another." I think we had better take off this dog's tail in the same way.

Mr. STEPHEN N. BOURNE. Well, I think you had better take it all off at once.

Mr. STEPHEN A. KNIGHT. I shouldn't object to it.

Mr. LOUIS SIMPSON. Mr. President, I would like to bring up a point here. Our friend [Mr. STEPHEN N. BOURNE] mentioned that in those bales he had examined he found the staple damaged at the bottom. I would like to ask Mr. KNIGHT whether he has had any experience in that matter. I suppose if the staple were damaged it would be from winding the cotton upon an arbor too small so that the staple might be crushed from the great weight upon it.

Mr. STEPHEN A. KNIGHT. I have given particular attention to that matter and I consider that the process of winding has a tendency to straighten the fibre rather than to kink it, as the process of the compress, so that the cotton is really in better condition after being rolled on this bale than in the ordinary compress bale. I have examined some other makes and some other methods where the centre of the bale was exceedingly hard; in fact, so hard that it was impracticable to unroll the cotton only at certain times, and one party told me that in unrolling the cotton the only thing he could do was to lay it aside and as the atmosphere worked upon it take three or four pounds each day off the core until it was finally used up; but in our case there was no difficulty whatever. The cylindrical process practically excludes the air, so that when the bale is taken out of the press it does not seem to expand at all; it seems to hold just the size put up. But this particular press under which this cotton was put up is so arranged that the weight on the centre of the bale is less than it is as the bale increases. They have a sliding weight on a lever, driven by a worm, which slides the weight out as the bale increases, as I judge from the cut of it. So that when they first start the bale they do not get that ex-

cessive pressure that you would get if you had the same weight. Of course the percentage of weight would be a great deal more on the core if we had the same weight; but with this particular machine the weight is fed out as the bale increases in size. We examined very critically, both myself and my carder and superintendents and two or three cotton brokers, and we all decided that the cotton was in a very much better condition, as a whole, than in the square bale, and certainly in the feeding it was wonderfully improved. A man could take up all he could gather in his arms and dump it into the cage and it was all he had to do with it; while in the square bale, you know, we always had to pick those apart. The working of the machine seemed to take very much less power, and on the whole I was very much delighted with the round bale cotton.

Mr. LOUIS SIMPSON. Mr. President, Mr. HILL would like to explain the difference in his machine making a soft core and some of the machines making a hard core. I think it would interest all the members here to know this, as we are interested in that.

The PRESIDENT. I fancy we are anticipating another paper, perhaps.

Mr. JEROME HILL. I was just going to say about this cotton — the gentleman speaks of the paper put in the centre of the roll — that this was cotton put up before we had improved our process to the extent that we have now. I assure you, gentlemen, that our cotton will unroll to the core, every bale of it now. This test that Mr. KNIGHT has explained to you here was from a press that the American Cotton Company asked me to run at Jackson, Tenn., last season, with only two 70-saw gin stands, and the lap was thinner than it would be with what we usually use. However, I want to say to you that with our improved bat former which now use we have no trouble in the world, even with two 70-saw gins, in making a bale of cotton to unroll to the core by making them run the press slower and

making the bat thicker. As to the cotton being injured at the core, it could not possibly happen, because the pressure upon a bale of cotton as it first starts now is light and gradually increases as he has told you. As to the aperture in the bale of cotton, the hole for the rod to go through, we can make that nearly any size to suit your taste; you can have it to suit yourselves. Now other cotton that has come from this place since Mr. KNIGHT has used this at other mills, has not had one particle of trouble with a single plant at Malden, Missouri, with three 80-saw gins, which is next to the smallest size generally used in the South, not one particle of objection has been raised. In fact, I have reports with me from three mills in the last few days where it is stated that it unrolls perfectly to the core and the cotton was in beautiful condition. I wanted to explain that to you, because when we first made the cylindrical bale the core was very hard and we had a great deal of trouble about it, and it delayed our work for a long time.

Mr. STEPHEN A. KNIGHT. Mr. President, lest there be some misconstruction of my remarks upon this, I want to say to the Association that I am not advertising anybody's particular method of baling. The subject of the paper was the "Handling and Transportation of Cotton," and it seemed to me that it was pertinent under the circumstances to explain the condition of this cotton in this form, from the fact that it could be transported with so much less expense and with such a saving in insurance and with so much less tare. While I am not anxious either to speak in favor of or against the merits of the cotton, I was simply speaking of this to show that it could be put in that form without any injury to the cotton and save the very point that we were looking for in transportation.

The PRESIDENT. I think it is the desire of the Association to have the experience of its members upon just such a point as Mr. KNIGHT has dwelt upon.

The next paper on the programme is by Mr. T. F. LEAVITT of Boston, "Cotton Transportation from a Railroad Standpoint." Mr. LEAVITT is not a member of the Association and the paper was prepared by invitation of the Board of Government. I take much pleasure in introducing him to you.

COTTON TRANSPORTATION FROM A RAILROAD STANDPOINT.

T. F. Leavitt, Boston, Mass.
M. M. Hurley, Louisville, Ky. C. W. Gibson, West Point, Miss.

(By invitation of the Board of Government.)

It is gratifying to note that the subject of cotton transportation has attracted your attention and that you deem it of sufficient importance to warrant special consideration at this time, for you represent all there is in New England connected with the consumption of cotton, and therefore have a special interest in trying to secure the best transportation service possible and the most practical results attending the receipts of cotton shipments at the mills.

The average yearly cotton crop for the past ten years is represented to have been, in round figures, about 7,680,000 bales, divided as follows, viz.:

To northern and Canadian mills, about 1,829,000 bales.

To southern mills, about 640,000 bales.

To foreign mills, about 5,211,000 bales.

It is estimated that the crop for the present season will be about 8,500,000 bales, of which the northern and Canadian mills will take about the same as the average given for the past ten years. The southern spinners will take about the same as last year, viz., 900,000 bales, and the balance of the crop will go to foreign spinners and into the surplus. And the problem is presented the transportation companies to handle this large amount of traffic to the satisfaction of all interests.

Of the shipments to northern and Canadian mills, it is estimated that about one-half moves via all rail and the balance via the water routes.

If the shipping of cotton was confined to a few points and was of less magnitude, correction in methods of shipping and a decrease in the liability for errors from which arise much of the present trouble, would be comparatively easy, but the fact is, it touches about every transportation interest in operation between the western coast of Texas and the extreme eastern coast of Maine and into Canada and the British Provinces, every carrier having its own idea about how the business should be done and each also governed by separate and distinct interests, local and otherwise. Therefore, in considering the possible means of improving a business of such magnitude, in which so many interests are involved, we can only hope to realize, even under the best of conditions, what is apparently the greatest good to the greatest number.

Now, in order to cover the handling of cotton from the plantation to the mill, I have requested two gentlemen of extensive experience with cotton in the shipping sections to present their views. Mr. M. M. HURLEY, General Southern Agent of the Star Union Line, Louisville, Ky., has devoted many years to travelling through the cotton shipping sections, and writes on the cultivation, picking and transportation of cotton as follows:

"CULTIVATION.

"The cultivation of cotton covers four stages of progress: first, the planting season; second, early development; third, summer growth; fourth, the picking season.

"Weather permitting, the planter begins to break his ground in January. In March, and in some sections earlier, the scooter is run through the fields to lay off the rows. Next the fertilizers are put into the furrows; this is never put in with the seed, but in the bottom of the first furrow. It is estimated that fertilizing adds to the turn out of the crop about 50 per cent. After the fertilizers have been put in, the turn plow is used to turn the soil on each side of the furrow; the land is then ready for the seed.

"Planting begins in Texas as early as February, but seldom

before the middle of April in North Carolina, so that the season may be said to cover two and a half months. In cases of a late spring, frost or overflow, planting is later — sometimes not until June. A wet May or June is sure to be followed by a poor crop. Cotton is a sun plant. Cloudy, rainy or wet weather at any stage of its growth is undesirable.

"Three kinds of crops are produced: the bottom crop, middle crop and top crop. The bottom crop is from blossoms that come before July 20th. The middle crop is the portion which comes after that date, up to about September 1st, and the top crop is the portion which blooms after September 1st.

"The cotton plant is brought to a stand in June. The stand is strong, clean and healthy if the weather is suitable, but in unsuitable weather it is weak, grassy and sickly.

"The enemies of the cotton plant are lice, which temporarily retard the growth. This is sometimes called the rust or blight. Generally the damage done is not very serious, yet there have been occasions when it has been very great.

"Next comes shedding, which is the result of the cotton forming in excess of its strength to ripen. It is seldom that the harm is as serious as imagined, though there have been cases when shedding was too profuse, and this has always been followed by a scare. Rain in May or June, which always brings life and vigor to the crap grass, also discourages and impedes the growth of the tap root.

"But in the caterpillar or army worm, cotton has its worst enemy. The boll worm has a small appetite; one boll worm, it is said, destroys only one boll, and as they are never numerous they are not very injurious. But the army worm has a never satisfied appetite, destroys everything green and leaves behind not a leaf or twig to protect the boll from the sun. They appear in the latter part of June or early in July. They are about as large around as the ordinary lead pencil and grow to less than two inches in length. They multiply very rapidly, and if they appear in full force as early as the middle of August, they

are very destructive to the crop. Rainy seasons are favorable to their growth.

" PICKING.

" The planter is becoming every year more independent. He has increased his cash capital, and consequently does not buy so much on credit. Cotton is being regarded as a surplus crop; the planter now raises a larger proportion of food products for the maintenance of his household, and each year finds him more independent of the money lender, of the cotton factor and of the laborer.

" The season for picking is controlled by the early or late maturity of the crop, the character of the weather, whether rainy or dry, and the floods from the rivers.

" About September 1st the cotton is ready to begin picking. The planter first gathers all the laborers he can and starts for the field. The laborers generally have nothing more than a wagon, a pair of mules, and cooking utensils. They are paid for their labor by the hundred pounds picked, the price ranging from 40 to 75 cents per hundred pounds—the more the market price of the cotton the more the pickers receive. An average picker should pick about 150 to 175 pounds per day, while some less expert can barely reach 100 pounds. A few experts can pick 400 pounds, but this is very seldom. Scattered about in the fields are small houses or rooms, from ten to twelve feet square, and seven or eight feet high. The planter has his weigh-master at each of these pens, whose duty it is to weigh all cotton and keep a correct account of the total number of pounds picked, and how much each one has picked. When the total weight in the pen reaches 1,600 or 1,800 pounds, it is then hauled to the gin, where the lint is separated from the seed. The amount of lint produced from the seed cotton is a little less than one-third. All producers of cotton of any note have their own gins; small producers and croppers patronize and send their cotton to the nearest gin in their respective neighborhoods. The ginner gives the planter the option of paying for the ginning

or giving him the seed for his services. The usual price for ginning is 45 cents per hundred pounds of lint cotton turned out, and an extra charge of 77½ cents for bagging and ties, making the worth of the seed at the gin about $3.02½ per bale of 500 pounds. After the cotton is ginned the planter hauls it home or keeps it in the gin yard, and when he has accumulated five to ten bales he carries it to market. The first work of the buyer is to cut into the bale and secure a sample, which he examines, satisfying himself as to its quality and length of its fibres, and makes his bid. The full market price is never bid at first, but as each buyer raises the last bid one to two hundredths of a cent, it has soon reached the quotations; sometimes it is carried a little higher, according to the indications for the future. After the cotton is sold to the buyers, it is generally allowed to accumulate in warehouse or compress until the amount has reached 500 to 1,000 bales, when it is shipped to the commission merchants or direct to the factories in the East.

"TRANSPORTATION.

"Previous to the war there was no market of any considerable importance in the North except New York, while in the South, New Orleans, Mobile, Savannah and Charleston were the principal markets. Since the war only a small per cent. of the overland receipts have passed through New York hands. The bulk of the cotton now passes through New York, going to other northern cities or direct to the northern spinners. The principal overland gateways are St. Louis, Mo., Hannibal, Mo., Cairo, Ill., Louisville, Ky., Evansville, Ind., and Cincinnati, O. To these points the southern roads bring the cotton and turn it over to the trunk lines. The rate from point of origin to destination is made by the southern roads adding their rates to the above points to the rate of the trunk lines east of such junction point. The southern roads derive greater revenue than the trunk lines. For illustration: Grenada, Miss., is 419.35 miles from Effingham, Ill.; from Effingham to Boston is 1,192 miles. The rate from Grenada, Miss., to Effingham is 34.2 cents per

hundred pounds. The rate east of Effingham to Boston and all points taking Boston rates is 30.8 cents per hundred pounds. The eastern roads therefore carry the freight 779.65 miles further than the southern roads and earn 4 cents per hundred pounds less. The disparity of earnings shown above is a fair average on shipments originating at interior points. From Memphis and Vicksburg the division of the through rate is on a more equitable basis, the revenue being distributed more on the basis of miles carried by the southern and eastern roads.

"Prior to 1888, little attention was paid to routing cotton by southern shippers, the practice being to take original bill of lading from the southern road, leaving the general freight agent the privilege to forward shipments from their terminal by as many different railroads and lines as suited his interest or pleasure. It therefore frequently happened that a shipment of 500 bales was distributed over several railroads and lines, causing trouble, annoyance and confusion in finding shorts, locating responsibility for overcharges, and other attendant evils. So difficult was it to procure a settlement of just claims, that shippers and receivers in many cases, after efforts continuing through years, gave up in despair, and charged claims to profit and loss."

Mr. C. W. GIBSON, Cotton Agent for the Mobile & Ohio R. R., West Point, Miss., has been in personal charge of the cotton traffic from points on the line of the M. & O. R. R., for many years, and he writes as follows touching the handling, shipping and transportation from the warehouse to the delivery to the trunk lines:

"I have the honor to acknowledge receipt of an invitation to communicate my views as to the transportation of cotton from southern points destined to New England cotton mills. I take pleasure in submitting some thoughts upon this subject to be read to the New England Cotton Manufacturers' Association at their next meeting.

"In approaching the subject of receiving and transporting cotton by the railways and other carriers, it may be of interest

to explain the methods of preparation for transportation. Originally planters erected on the plantation and owned the ginnery and press, which was operated by hand and horse-power. The work was laborious and slow. Rope was used to bind the cotton bales; about the same character of bagging was used then as now, and the size of the bale was about the same. In due course better gins and presses came into use, hence at the present time nearly all the ginning and pressing is done by steam power and by public gins, the owner of the cotton paying so much per bale for the entire service of ginning, packing and covering, and on this account much inferior bagging is used. The original bale is carried by its owner to the nearest market, stored in warehouses or compress, weighed by a sworn weigher, sampled and receipted for, and if the bale is not in good order, same is noted on receipt. The owner with the receipt and sample then visits each buyer and sells to him who offers the most. Often if the market is unsatisfactory he pockets the receipt and waits for a more satisfactory market. When the cotton reaches the shipper it is classed, marked on the edge with a brush and ink, usually in plain letters and sometimes in hieroglyphics intelligible only to the consignee who requests their use. It is best to use simple marks of three or four letters, one of which to represent the grade of the cotton if desirable. It is now sent to compress where it is carefully examined and all disorder noted on receipt issued. The cotton is then compressed and loaded into cars. If any of it is in bad order it is repaired in course of compressing. The compresses represent the railroads in receiving and loading cotton, and are required to give satisfactory bonds, and are held to strict accountability.

"Now as to the transportation. The movement of cotton by all rail lines from the smaller shipping points in the South to the East began about sixteen years ago. Up to that time the New England spinners secured their supplies largely from the ports and the larger interior cities. Owing to the active competition with foreign markets at the ports, spinners sought for and found that cotton could be purchased cheaper of those

buyers who came nearest in contact with producers. Up to this time the chief obligation of carriers was to transport cotton to the ports and the large interior cities uncompressed. Compresses located at interior points were unknown factors, hence the bulk of the cotton moving to ports was transported uncompressed and upon open or flat cars. A box car would carry only about half the number of bales that could be carried on a flat car. As the movement increased in the direction of eastern points, compresses were located at the Ohio and Mississippi river crossings, where most of this cotton was stopped for compression, and was sent forward when compressed over the various fast freight lines connecting at the rivers with southern lines. All this was new, both compresses and railroads were ignorant of the best methods of handling cotton in the most satisfactory way. Frequently such compresses were managed and operated by unscrupulous persons who would abstract a few pounds from nearly every bale of cotton passing through, hence creating a situation at destination of differences in weights. As soon as this difficulty was understood, compresses were located near points of shipment, hence at the present time nearly every town handling as many as 8,000 bales have compresses.

"Necessity in business as well as in the sciences has produced specialists. Railroad companies are disposed to have special classes of traffic cared for by agents who are specially fitted for that particular class of traffic which they oversee. Recognizing the signs of the times some of the southern and eastern lines have specialized the cotton traffic with much success. Most carriers as well as men are slow to adopt new features of business, hence in the carriage of cotton the slower and so-called conservative carriers are being gradually pushed up to a higher standard of service by those who are progressive. The unfailing law of competition is doing its work.

"The best work in the transportation of cotton is in the loading at compress, and transfer en route. Where this is done by competent persons there is rarely any difficulty at destination. Experience has demonstrated when errors of checking and load-

ing occur previous to arrival at destination, it is difficult to correct. Some of the New England railroads appear to have arrangements with cotton mills, when cars are delivered to them, to have them unloaded and checked, and it is frequently the case that discrepancy in marks are not reported to the railroad, and sometimes over bales are not reported, but are finally used to make good, cotton short on other marks. When checking is done by the mills, the agent of the railway delivering should be promptly advised of discrepancies in the marks and contents of cars.

"Various devices in tags have been used to better maintain the identity of cotton, none of which are useful unless placed on the bale after compressing, and as this work is usually performed by an inexperienced negro, it results in more confusion than benefit, the tags getting on the wrong bale. Hence the most experienced carriers have abandoned them.

"It is impracticable to transport cotton from southern points to New England cities in through cars, for the reason that the southern lines cannot allow their equipment to go East on account of the great length of time required to get their cars returned, but as most of the southern lines connect direct with those aggregations of railways called fast freight lines, little difficulty is experienced in making transfers, and no hurt to consignees, provided the southern lines make delivery to those fast freight lines known to be worthy and competent.

"Much can be said about the thought being devoted by interested persons in the South as to the improvement of the bale in size and otherwise. Much effort is being made towards the securing of a uniform bale of smaller size than the present one.

"There is little to say regarding the transportation of cotton to southern mills. Most of them draw their entire supply within a hundred miles of the mill, making it unnecessary to compress. Many mills purchase their supply direct of farmers, who grow it within a short distance of the town where the mill is located, and transport same by wagon direct from gin to mill, therefore no transportation troubles are experienced by the southern mills.

"In conclusion, there appears to be a general desire on the part of carriers of cotton to make as perfect as possible the system of handling and transporting cotton, and to organize and co-operate with their connections to this end. The chief difficulty in proper organization is the multiplicity of fast freight lines, through agencies actively soliciting the business. This also makes the prompt settlement of claims impossible. Some of the southern lines are assuming the prompt settlement of claims, provided they are left free to direct the cotton over such lines as they have agreement with, to join in such prompt settlements."

By reading a cotton bill of lading one has reason to believe that the shipment covered thereby has been received by the railroad company in good order and condition, bales marked as per margin, etc., but you have seen that the bales have been handled several times for sampling, marking and compressing before delivery to the railroad by the compress, and that the compress repair evidences of bad order by patching up the bales, etc. In the compressing marks become covered up or defaced, and the sample holes expose the contents. Nevertheless the railroads take the cotton in this condition, subject to any discrepancies that may develop, due to the many opportunities for shortages and mixtures by reason of poor or erroneous marking, loading and accounting, and issue a "good order" bill of lading. From some sections the transportation from compress point to destination is unbroken unless by accident, and, when possible, such service should present the best results. From other sections one or more transfers in transit are imperative because the initial road will not permit its cars to go beyond its junction points where delivery is made to its connections, it preferring to keep its own cars in use on its own line for economical and other reasons. Every transfer on the way means additional chances for damage, mixture of lots, diversion and loss of bales. The bales after being loaded into a car at compress point seem to swell up or expand, due to the motion of the cars; and at transfer points they often have to be pried

out, causing more or less damage to them. Nevertheless, a bale of cotton properly put up and loaded ought to stand one transfer at least without loss or damage, especially so when the handling is simply across a platform from one car to another. While this transfer has its objectionable features, it would be well to realize that there is a compensating effect for it in the fact that it serves to act as a check on the loading of the initial road or the compress company, and locates at once whether shipments have been forwarded as claimed, or otherwise. If the transfer develops exceptions of any kind it locates the responsibility for them upon the line up to the transfer point. If no exceptions are noted at the time of transfer then any subsequent errors discovered must have occurred at or east of the transfer point, and in the event of claim for lost bales or other causes, this record of transfer shortens the road to settlement. Furthermore, such intermediate transfer permits initial lines to receive prompter notice of any discrepancies and frequently leads to a quick solution and correction, whereas delay in receiving such information would mean the contrary; all of which is mutually desirable and advantageous to consignees, shippers and the railroads

On arrival of shipment at destination a concentration of all the errors that may have occurred at any one or all of the points mentioned, including those made at destination, has to be met, and then comes the crucial test and the opportunity to demonstrate the ability to adjust such matters quickly and satisfactorily. Errors in way-billing shipments, such as sending to the wrong destination, using wrong mark, weights and rates, etc., are difficult to prevent, as they seldom occur twice at the same point or from the same cause, but they create overcharges oftentimes bothersome and difficult to collect, and being generally the fault of the railroads, require their special consideration and treatment.

It is obvious that the consignees cannot undertake to study each case, develop the source of the trouble and apply a remedy; furthermore, there are hardly two points in New Eng-

land where exactly the same conditions prevail in governing the delivery and accounting between the railroads and the consignees.

The delivering road has to take the cotton as it may come, from all directions, by all routes and in all sorts of condition, charges right or wrong, as the case may be, and in years past, and perhaps to some extent to-day, consignees have felt that the delivering road should stand in the breach and straighten out all the errors. In a measure they can and should, as there may be errors on their part which they of course must attend to. Yet if placing the burden entirely on the terminal road brought about more perfect results in subsequent transactions, and was the best course to pursue, then the consignees by this time would have no cause for complaint.

Previous to 1888-9, when shipments were generally made without regard to route and independent of consignees' interest from a routing standpoint, the receivers seldom knew how or by what route or line a shipment was to arrive, and in the event of any trouble from whatever cause it might be, they practically knew no one to whom to look for relief excepting the terminal road, and the terminal roads, like the consignees, had little voice in determining how the cotton should be brought to them or how it should be handled, hence they were hardly in a position to warrant their assumption of any and all obligations that had accumulated on arrival of the property at destination. If the consignees assumed all the troubles attending the receipt of cotton, which they usually did, and then presented claims against the terminal roads and waited developments, they got a settlement in due course, as a rule, but the investigation of the matter on the part of the railroads was generally such that seldom was it the means of effecting a suitable remedy, for, as experience shows, the same troubles continued year after year until relief seemed almost hopeless. No reforms appeared to follow the development of erroneous methods of doing the business, and no penalty was attached to poor and unbusinesslike methods and results. It took three, four or more years to settle

a claim, or if it was never settled it was all the same; experience counted for nothing and advancement under such conditions was hardly to be expected.

It was during the season of 1888-9 that the subject of improvement in cotton transportation began to receive the attention it deserved by the shippers, consignees, brokers, and the railroad companies; and it was then that one of the principal through freight lines, realizing many of the troubles consignees were subjected to, and something of the causes thereof, conceived the idea of introducing into New England improved methods of handling all matters connected with the cotton traffic, with a view to better conditions and results, beneficial to themselves as well as to shippers, brokers and consignees.

The interests of all these being mutual, it was manifest that any action tending to benefit one would naturally benefit all. The evidence up to date given had been to the effect that no special advance had resulted from any of the then existing methods, and there were no signs of immediate improvement perceptible. It was then that the receivers of cotton in New England, appreciating the demand for some kind of a change, beginning to realize something of the causes that had heretofore intervened to retard if not wholly prevent the desired results, and recognizing the possible benefits that might follow the action of the freight line referred to, saw the necessity of interesting their brokers and shippers in the matter of routing, basing their action on equality of rates, improved service, prompt and intelligent attention to claims, and many other matters of detail. The results have apparently justified the means, for the practical demonstration that has been going on in your midst for the several years last past, of which many have been fully cognizant, has been satisfactory proof of the advantages following the course pursued, and warrant its continuance and all possible enlargement of its field of operation and adoption.

Some of the advantages already derived from routing are as follows:

Prompter deliveries.

Cotton in better condition.

Less claims for overcharges.

Less claims for short bales.

Much more prompt settlement of all claims when they are necessary.

Uniformity in invoice and bill of lading weights.

A general improvement in all directions and a bracing up of all lines to meet the new requirements, resulting in a smoother all round business to-day than ever before experienced.

Terminal roads recognizing and appreciating the value of the changes developed, have systematized and improved their methods of accounting and deliveries.

The great relief to shippers, consignees and brokers by the general satisfactory results up to the present time.

Previous to the date mentioned, shippers had apparently failed to appreciate the conditions that prevailed in New England, or the many losses and other troubles consignees experienced, due largely to their failure to route shipments by a reliable line, or in fact by any line, but as they come to better understand the subject and consignees' purpose, they should, and no doubt will be glad, to co-operate and make future routing an object of easy attainment. There are sections from which routing by any particular line beyond the initial road is not recognized, although consignees' right, or the right of the shipper to route, is unquestionable. This action by the initial roads is a local matter, as there are often valuable concessions to shippers or other good and sufficient reasons to effect or offset the choice of route, upon which we need not dwell at this time. There are, however, many shipments unrouted every season from territory in which routing is permitted, and the failure of consignees to avail themselves of it is to their possible disadvantage and annoyance.

Shipments unrouted, whether by oversight or by refusal of initial lines to recognize routing, are generally used by such roads for selfish advantages, as after taking the longest possible

haul they turn the business over to one or more of their connections in exchange for the largest amount of return traffic obtainable and without further responsibility or interest in your cotton. Lots are split up as opportunities for trading the traffic appear, and shipments consequently arrive at destination over several lines, complicating matters accordingly. The custom of trading unconsigned freight is businesslike and the railroads cannot be blamed for using it to their advantage, but when the consignee or shipper suffers from its operation they may be expected to complain.

I am pleased to say, however, on this point, that from some sections no hardship will follow a continuance of this course. It is not the railroad exercising this custom to consignees' advantage of which they need complain, nor to which I refer. I have in mind only the one that does not consider the mill's interests, and consignees will find that a large majority of their complaints come on shipments from or via such roads.

Shippers and consignees should settle between themselves who is to decide the routing and be governed accordingly. It is apparent that the responsibility for the selection of a route must rest with one or the other. It cannot be divided or ignored and satisfactory results follow. If for good and sufficient reasons this responsibility is left with the shippers or initial roads, then the consignees should take the cotton as it comes, paying all charges and settling all differences with shippers or initial roads, without regard to the line by which the traffic moved or the terminal road. To realize the benefits following the routing by consignees since 1889, you have only to compare them with the results derived from the methods in force previous thereto.

Just so long as many of the present methods of shipping exist and cotton is put up in the present square bale, the fact is undeniable that to realize the desired improvements in cotton transportation, the matter of routing is of paramount importance, and when all interests appreciate this fact, as many now do, then it will become the established custom from all cotton shipping

territory. The matter is practically in the hands of the mills, and has been rapidly extending as its benefits have been revealed during the past few years.

Every bill of lading received, covering a shipment of cotton, should show the invoice weight and the route or line by which the freight is to travel to reach destination.

The new method of compressing in the round form, by the American Cotton Company's process, known as the Round Bale System, commends itself from a railroad point of view as being far superior to the present square bale. It is easy to mark and handle and presents less opportunity at all points for errors in loading, transferring, checking and delivery. It has been justly termed the "Ideal Commercial Bale."

In closing, I beg to sincerely thank you on behalf of Messrs. HURLEY and GIBSON and myself for your kind invitation to present our views on this subject, hoping and trusting they may in some degree commend themselves to your attention and possibly help you to still further improvements and advantages in your future experience with cotton transportation.

The PRESIDENT. Does any member of the Association wish to ask Mr. LEATITT any questions? It is the custom that if a man is willing to read a paper he is understood to be willing to answer questions.

Mr. STEPHEN A. KNIGHT. Mr. President. Mr. LEAVITT seems to catch the fact that the whole matter is in the hands of the New England cotton manufacturers, so that really I do not see that we have anyone to question except to put the questions among ourselves, as to how long we will submit to what we have been submitted to. It strikes me that the very able article that has been read is simply admitting what we have claimed to be the fault, that the cotton is very carelessly and unreliably handled; and I still maintain that the only remedy for this thing thus far presented will be through transportation, which I believe is possible to be brought about through the efforts of the New England manufacturers.

The PRESIDENT. I notice that Mr. LEAVITT emphasized somewhat this clause: "The matter is practically in the hands of the mills." So it still seems to be a problem for the mill men to solve.

Mr. LOUIS SIMPSON. Mr. President, upon this matter I would like to give you my experience. I have had a good deal of experience with the railroad people. When I first went to Canada, some ten years ago, it used to take about half my time to get any claims I had settled. It is not so now. I route my cotton in my own way and if my claim is not settled I at once change my route. I now have the railway agents coming from the South looking after my business, and they will guarantee that all the claims shall be settled, and they are settled. But the great trouble, as far as I can see now, arises from the circumstances which are noted in one paragraph of the paper read. Is is this: "It is impracticable to transport cotton from southern points to New England cities in through cars." Now I quite see the difficulty, but to my mind there should be no difficulty at all. The trouble arises in this way: some of the southern lines have cars much larger than their connecting companies.

Now if the southern lines would only pack their cars with just so many bales as their connections could carry forward, then we could have no bales lost. As it is now, the cars from the South may hold 60 bales, while their connections can only hold 50 bales. The consequence is, you get one carload with 50 bales and the other 10 come along at any time within two or three months. The trouble is, the southern lines are too selfish. Not only do they get a higher rate for the work they do, but they want to do everything their own way. I feel quite sure that if we all kicked and carried out the policy I have adopted for our own consumption, we should soon have the southern lines as ready to do what we require as we find the northern lines now.

The PRESIDENT. We would like to hear from one interested in the southern mills, to know if they have any trouble in the transportation or handling, and I will call upon Mr. D. A. TOMPKINS of Charlotte, N. C.

Mr. D. A. TOMPKINS. Mr. President and gentlemen, I think that the transportation of cotton is a matter that will follow very much the same course as the transportation of other articles. Wheat was formerly shipped in sacks, and a proper solution of its delivery at distant points was to abandon the shipping in sacks and to make cars tor the purpose, shipping it in bulk. The transportation of meats from Chicago took a long time to develop, and without special facilities like ice cars, transportation lines that send their cars all the way through, warehouses at the end with refrigerators to receive the meat when it got there, it would be quite impossible to commercially transport meat at all to the distances to which it is now done. The whole export business in that line hinges upon the development of the transportation facilities necessary for through transit. Now cotton has been less worked upon in that line than any other article that I know of. It was formerly put in shape simply to be hauled from the plantation to the market town. That was the only purpose desired to be accomplished. The balance of the transportation was considered easy. The present bale resulted

from undertaking to make a package that could be hauled twenty, thirty or more miles through the country to a market town where it could get water transportation. It was developed before the railroads were developed at all. The process of manufacturing cotton practically begins when the farmer turns his cotton over to the ginner. Ginning is a manufacturing process. The process of baling cotton and putting it up for transportation is all simply doing something to be undone again, and we will have to rearrange that whole business. The cotton seed oil mills throughout the South have done a great deal in the direction of doing away with unnecessary work and of giving cotton to the manufacturer in better shape than it has been done since the time of the late war. These new efforts to make round bales are very large movements in the direction of eliminating a great many processes that are entirely unnecessary. And just as in former times the spinning and the weaving were separate in the household, but now they have become organized manufacturing processes all under one roof, so the manufacture of cotton from the time of the ginning until it is put in proper shape for sale and use in a mill has got to be developed into one organized process. The method of doing that, in my judgment, is rapidly coming about, I think that the probabilities are — we cannot tell — it must of necessity be a development. Each process is worked out to see what advantage it has; every improvement that is found is retained and every experiment that is made that brings no improvement will not be retained. There will be a complete process of ginning cotton, of putting it into some convenient package that will be carried into a cotton mill, where the process will go on — nothing being undone whatever; and there will be some kind of transportation arrangement by which, I think, these laps, or short round bales, possibly, will be put into cars without any other packages than the car itself, and shipped directly to your cotton mills on through lines — possibly lines created for the purpose, not railway companies at all, but transportation companies, like the cattle companies or like the meat companies. The first prerequisite of that is to get responsible people ginning

the cotton at the other end of the line. The ginning must all be done by a responsible institution, either an individual or a corporation. The oil mills have already attained to this condition. The ginning was formerly done within the last thirty years by small ginners, and cotton had to be accumulated by buyers and go through a great many hands. All the sampling that was done was necessary to protect the buyer himself from imposition by some small ginners. Ginning is becoming a manufacturing process. The cotton manufacturer North will have to apply to a responsible company, either a ginning company or a cotton seed oil company, and buy his cotton direct from those institutions, then have it put into cars, which themselves will be the packages, and have it come through to the northern factory and taken out and put on to your machines and the process goes on. That, in my judgment, is the way in which this development will come about, and it is the way toward which it is already tending. It involves the organization of transportation companies, which, I think, the American Cotton Company will take up in due course of time if they develop a business that will warrant it. If they do not somebody else will. There are a number of people studying the subject. There are a great many good and well organized corporations that are giving it a great deal of attention, and if one of them does not do it others will. It is simply an understanding of the subject, knowing where to apply to get the cotton and the cars, and the through transportation and everything of that sort will, in my judgment, develop, and we shall have a manufacturing process that will begin when the farmer turns his cotton over to the ginner and that will continue until it is done and finished into good cloth in the mill. In the South a great many of the cotton mills will do their own ginning. They will attach lapper appliances to the end of their gins. The cotton gin is as good an opener, in my judgment, as can be had, and a great many of them will probably, at an early date, start to manufacture laps in their gin houses. They may buy seed cotton, put it in a warehouse and gin it as it is needed it, or they may gin

the cotton rapidly in the fall as it comes in and then store it in the shape of laps to be used. These things will be matters of development. We can hardly foresee just how each particular process will come about, but the development will undoubtedly eliminate a great many of the complaints that you are now making and will eliminate a tremendous amount of intermediate work charges, handlings and a great many other annoyances that you now have. I do not see anything that could be done that would facilitate it greatly, except for you to deal with those people who are giving the business special attention and to buy your cotton from responsible corporations in the South, and as soon as transportation companies are formed and cars put on to bring cotton through, to have it brought in that way [applause].

The PRESIDENT. The next paper upon our programme is "The Round Bale and the New England Spinner," by Mr. D. C. BALL of St. Louis, who will now read his paper.

THE ROUND BALE AND THE NEW ENGLAND SPINNER.

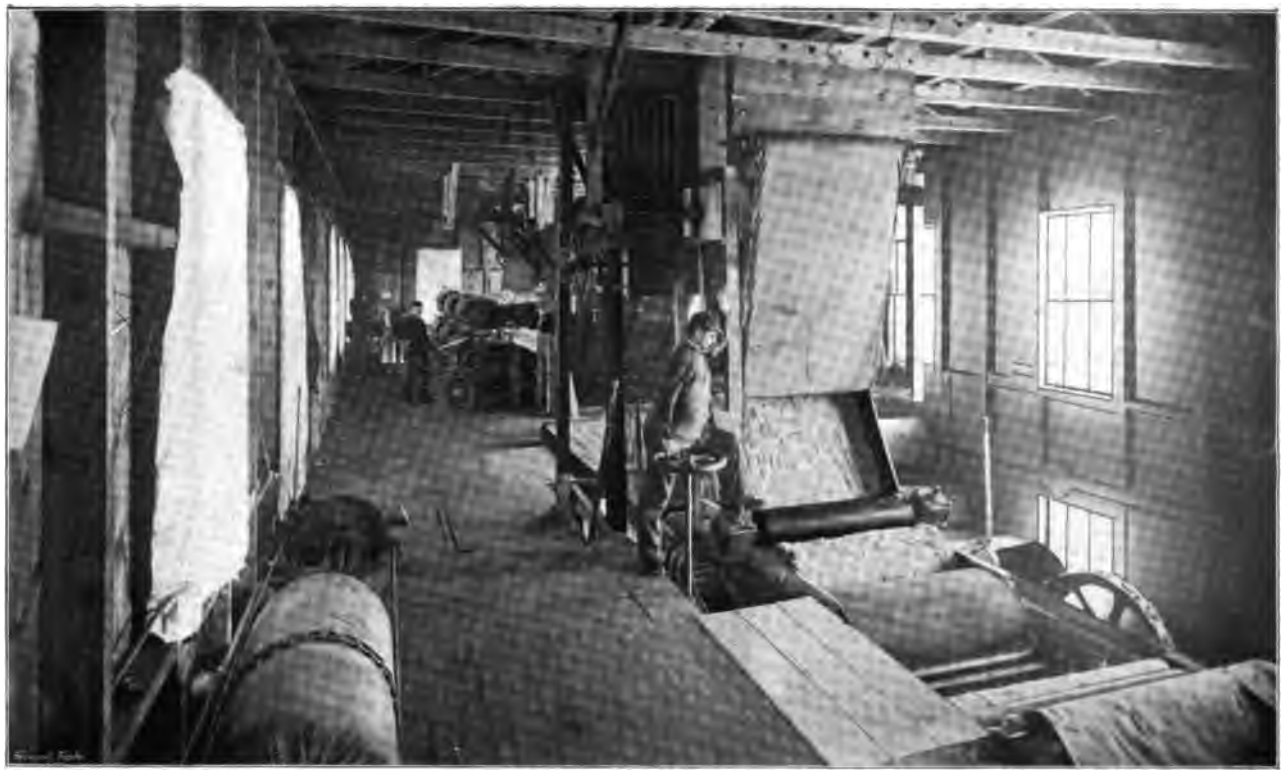
D. C. BALL, St. Louis, Mo.

I hardly knew whether I dared to come up here on the platform or not, especially after what Mr. GIBSON had said about the compress man, because I have been a compress man myself a good many years, and I cannot help but plead guilty to all the hard things he says about the compress man. I have been through it; I know it is a fact. Perhaps I may be betraying a little confidence when I say that even after I had stopped what was the popular practice of trimming sample holes in a compress, for one year in my handling at the office and compress together of about 70,000 bales of cotton, we had 273 bales of loose, and we were considered as the model establishment, too. [Applause.] And we were only one of about four or five hands that that cotton went through, too.

The PRESIDENT. It seems as if we had driven one of the evils to cover.

The round bale was introduced last season, forty-two of the eastern mills using the cotton. Every bale manufactured was taken. The round bale system overcomes every objection to the old bale — the abuses in handling, risks in purchasing.

The new system takes the seed cotton from the producer, cleans, gins and carefully prepares the cotton for market; densely compresses the bat into a compact cylinder, and securely protects it with a closely woven covering; the bale is clearly



A ROUND BALE PLANT IN OPERATION—GINNING AND COMPRESSING.

marked with number and weight, which weight is guaranteed. A sample is drawn in process of making, one-half of which is supplied to the purchaser, who is also guaranteed as to the even-running character of the bale and its freedom from false packing.

It does away with the jute bagging and ties, the new covering weighing 3½ pounds, which constitutes all the "tare," instead of the former 21 to 28 pounds. The new covering is a protection against waste, pilfering, water and damage, and is worth to the mills for re-wrapping almost its cost per pound.

The round bale is practically fire-proof, as "it does not contain enough oxygen to support combustion." Consequently, it effects a great saving in insurance, a cut of 50 per cent. having been generally allowed the new bale, and since the recent successful fire tests it is expected that it will take "preferred merchandise rates."

It has no "loose" or exposed cotton, thus effecting almost perfect security.

It is the most easily handled of any cotton ever put up. It occupies, comparatively, only 60 per cent. of the warehouse space.

Its clearly stamped weight is guaranteed and maintained, as the thorough airing and drying before ginning prevents its losing weight while "in stock." Each bale is clearly marked, so no "substituting" or "apportioning."

It easily loads 100 bales to the ordinary car (150 to 160 bales are regularly shipped by the company), so that each "100 bale lot" goes through in one car. Result, no "overs and shorts."

The bat of which the bale is made unrolls like a carpet; with a simple apparatus and a minimum of labor the cotton is fed from the bales (mixed as desired) directly to the machines without being touched by hand. A material saving is effected in the opener room. No "country damage," no "cotton clinging to jute bagging."

The round bale tare is 3½ pounds; the weights are guaran-

teed to be within two pounds. There has never been a report of a loss of as much as a pound per bale from invoice weights. So with the average 23 pounds bagging and ties on the square bales and the loss resulting from the customary "weights guaranteed to within 1 per cent.," this average of 28 pounds total (which is often considerably exceeded), is offset in the round bale, by not exceeding 5 pounds. In practice the saving is 23 to 25 pounds in the actual net cotton received by the mills. Taking 22 pounds only at, say 8¼ cents, amounts to 36 points, add the difference in the value of the covering, brings it up to nearly 40 points in favor of the round bale. So the round bale saves in net cotton alone a full ⅜ cents per pound besides the other advantages. Any purchase at a less figure over the price of the ordinary square bale represents that much additional profit to the mill.

The American Cotton Company by its system, in addition, guarantees the character and grade of the cotton it sells, and the responsibility for delivery of that character when purchased. It guarantees the character of the bale in every manner and the actual net amount of cotton the spinner will receive. The same uniformity and reliability that attaches to the manufacturing is applied to the classing and handling.

This is a brief statement of the more prominent advantages of the round bale itself from the standpoint of the spinner. There are others that are being constantly pointed out to us by almost every practical spinner who investigates the round bale. The only reasonable objection we have ever heard raised against it applied only to the bales as originally made, viz., some difficulty in unrolling on account of what were called "hard centres." For once and for all let me state here, this difficulty has been absolutely overcome. The new 48-inch round bale is made on the improved press wherein the "pressure on the bale through the interposition of easily-manipulated, soft, yielding surfaces is the same from start to finish, and the cotton at no time comes in contact with the hard iron rollers." We guarantee the absolute unrolling of every bale.

"EXPERIMENT STATION," THE AMERICAN COTTON CO.

A ROUND BALE GIN-COMPRESS PLANT,

Showing cotton direct from the Gins, all ready sampled, weighed, marked and compressed, and ready for the mills.

The imaginary damage by excessive compressing has been thoroughly disproved and requires no argument.

As to sampling, one of the strong points of the "round bale system" is that a thoroughly authenticated sample is drawn in process of making, and its identity with the bale and responsibility for the correctness of same, fully preserved through to the consumer who receives a portion of that identical sample. Thus the most perfect protection is accorded at a minimum of expense to all parties, because without waste, and affording far greater security than under the present loose, extremely wasteful methods. As a result all cutting and disfiguring of the bale is avoided, and the perfect bale just as turned out at the gin, completely protected, is delivered to the mill with contents and wrapping intact. Nevertheless, if for any reason it is desired that the bale should be sampled, it can be done just as easily and as many times and exactly in the same manner as in the old bale. A sample can be drawn from either end, but not as readily as from the outside. The loosening of the cover and turning back at either end exposes the character of the bale perfectly, giving a better "examination" than is possible under the old method, and without waste or disfigurement. An auger can be inserted into the centre of the bale as readily as in any other compressed bale. All these wasteful practices are obviated and far greater security offered to the mills by the new system.

We have invited criticism, and we continue to do so. We propose, as far as possible, to give the mills just what they want and in the shape they want it, and at the very minimum possible expense.

It is unnecessary before this body for me to touch upon the already fully exploited evils of the old method of handling cotton. The "cotton world" is aroused on this subject, and the matter is being fully ventilated. But I do invite your attention to how completely the "round bale system" overcomes all of these objections, and particularly as they relate to the mills and the New England spinner.

First, as I have shown, in the enumeration above of some of

the advantages, the round bale is a complete "reform" in the bale itself in favor of the spinner; second, in the savings it effects; and third, in the protection the system gives.

The "eastern spinner," particularly, is placed upon a better footing. Beyond the savings and advantages enumerated and others connected therewith, the mills will be benefitted from the cutting out of the half a dozen or more wasteful handlings, the "concentrating for compressing and the compressing itself, and all of the vast expense connected with these processes. "The New England spinner will benefit more largely than any others in the savings that will result in being able to load cars with a practically non-combustible, non-injurable freight, in practice to considerably over 200 per cent. of the present average loading of compressed cotton, besides entirely doing away with the handling of uncompressed cotton. Incidentally the mills will save the waste, pilfering, damage, absorption of moisture and grease and the "drying out." The insurance in transit is cut about in half.

The introduction of the "round bale system" of handling cotton will work a material relief from the evils of the present system under which the mills are forced to purchase so large a portion of their cotton. Without entering into an unnecessary discussion of them, it is sufficient to say that the new method of handling cotton completely changes this, removing the element of risk as regards grade, character of cotton, waste, weights, etc., and ensures the purchaser actually receiving the cotton for which he contracts. The new system offers the mills perfect security on all points.

Mr. EDWARD ATKINSON says: "Of all the bad and wasteful practices which now prevail in our work, the very worst are to be found in the treatment of the cotton from the field to the factory." The American Cotton Company, by its improved methods, will work a very great change in this, of which the spinner will be the principal beneficiary. This will quickly result in improving the character of the raw product. The "round bale system" deserves the support of the mills, if it accomplishes nothing else than this.

THE NEW WAY AND THE OLD WAY OF BALING COTTON.

"ROUND BALES" OF COTTON.

In view of the very great lack of uniformity in the weight of the covering of cotton because of the varying methods and conditions and the general impression amongst the farmers that they sell you their bagging and ties at the same rate per pound as their cotton, it is a fact we all know that the uncertainty that exists as to the tare is one of the ever present problems of the spinner. The present system really invites unfair practices from which the mills suffer. It is unnecessary for me to discuss the question of net cotton; you have done so fully, and I believe have made up your minds as to what is to your interest. Why should the New England spinner continue at this disadvantage, instead of being in line with foreign mills? At least why not adopt this in dealing with a new system which is being inaugurated on a commercial scale and where it can be easily established?

One word further. The American Cotton Company, operating the "round bale system," takes the broadest ground as regards improvement of character of product, handling and package; of direct handling at the very minimum expense; of meeting every requirement of the mills. If, in line with that, in the wisdom of this Association, an opportunity is presented for a simpler *official* determination of all questions of grade, character, etc., to facilitate the business, I believe they will find the American Cotton Company ready to meet them on it.

Mr. D. C. BALL. Mr. President, I would like the privilege of supplementing this statement from our company with remarks from a few notes that I have made in connection with the papers that I have heard here to-day.

The PRESIDENT. I think the Association will be glad to hear you.

Mr. D. C. BALL. For one thing, sir, I will say that I brought here to demonstrate to any of you gentlemen that have not seen the round bale, two bales of cotton, those two bales which you see in the corner. Those came from Waco. They came to East St. Louis — as has been truly stated, we could not ship through, and we stopped them at East St. Louis and sent them on here. Today we telegraphed on an order for a couple of hundred bales to come from the same place. The bales of cotton as you see them there are representative bales, like some five thousand and odd of them, except that the others were longer last year, and some thousands of them this year. We guarantee, as I stated here, those bales of cotton in every manner and according to every claim that we have made in regard to them. Further, as a matter of interest in connection with it, I have with me here and should be glad to have the members of the Association look at, a series of photographs of the old and new methods of handling cotton, things that I have been gathering up for the last eight or ten years, because I have been trying to prevent the waste of cotton for that time or longer; and in connection with that book I will say that there are illustrations there which show just the points that we claim and also to bear out the statements that have been made here. For instance, in the matter of loading, we have loaded as high as 169 bales of cotton in a car. There is an illustration in the book of a car loaded with 160 bales, weighing 68,000 and some odd pounds. Now let me say that that was not a special loading, but every day, one day after another, from any 48-inch plant that we have got we can load anywhere from 65,000 to 68,000 pounds in one of those cars and ship it straight through if it is so desired. If they will make it a special point

A CAR LOAD OF ROUND BALES—68,628 LBS.

HOW THE "ROUND BALE" UNROLLS.

and want the heavier loading, we can load 79,000 pounds in the car. Of course there is no necessity for compressing the cotton to that density; it means an added strain on the machinery, for which we get no return and we are not justified in doing it. But let me say — we are all interested in this — that car of cotton earned $754.91 from Waco to Boston or the New England point, wherever it went. The average car earns something like $260 against this figure of $754.91, which can be done every day with every car from every plant.

The question was brought up of the consignor sealing the cars. I agree with what Mr. KNIGHT said of that and it was the plan we intended to adopt. There was some objection to it at first, but we shall probably hereafter seal our cars and we shall in that case be responsible if the seal is unbroken when it arrives at the mill.

As regards fire, as I stated, the companies that insure for the railroads have cut the rates just in half. We have cut rates just about in half on handling and storing the cotton. By the way, storing in transit will be wholly unnecessary when the system is fully in operation. You gentlemen at the mills will get the advantages of that, as well as the advantages of lessened risk and lessened rates.

One gentleman mentioned the question of repairing square bales. That is, as you will see in the illustrations, one of the frequent sources of loss—repairing rendered necessary by the waste of the present system and the damages resulting. Ten days ago I was in Galveston, Texas. Not only there, but wherever I saw cotton at all — I will say, gentlemen, frankly that there is some cotton left out there; I do not think there is very much, but there is some cotton left there, notwithstanding my interest in seeing cotton go up and for you gentlemen to believe there isn't any cotton left — but wherever I saw a bale of cotton it was practically bleached white. Well, we know what that means; we know that practically all the best of the careful buyers practically pull out of the smaller markets in January, because of the loss and risk and waste there is from then on. I may not

put myself down as one of the most careful buyers, but I have not dared to buy any cotton since January. We have had a great deal of rain since January, and the loss resulting from the rotting of that cotton would be more than the profit of it. I am speaking of my square bale business.

One serious question that has come up with us is as to the attitude of the New England mills. Of course it is a business problem with us. As cotton men, realizing the enormous waste, we were ready to adopt this as a means of making money. For twenty years, nearly, I have been in the cotton handling business. Mr. HILL probably has been longer than that, considerably, and I know that he as well as I and the rest of us has always heard that the great trouble is the condition in which cotton arrives in New England and at the foreign mills, and that the New England spinner wants an improvement in cotton. Now, gentlemen, we have given you that improvement. We do not blame any man for standing back and letting somebody else try the experiment, because that is what it was eighteen months ago. Some gentlemen did come right out — under our guarantee, it is true — but they came out, held out the hand of fellowship to us, and we sold over five thousand bales of that cotton in the Boston district last year, and we appreciate the way in which those gentlemen did come to us. But the great majority of the spinners held off. When it was found that a few bales in the beginning had hard centres, it seemed to spread like wildfire that there was trouble. The result is that outside of probably fifty mills now — those that used it last year have very largely stood with us — outside of those, the rest of the spinners held aloof. Well, that is not in accord with what we have been led to believe that the spinners want. If you want an improvement, here is the opportunity. If you do not, gentlemen, it is going to mean this: if all the world held out, those of us who have been making our profits out of cotton the last few years are going to continue the old way and we are still going to get our 273 bales of loose year after year, or we are going to look to people abroad for a market for this cotton.

We are offered from 20 to 30 per cent. cut in the marine rates. That is going to mean the cutting out of a considerable expense. A large portion will go to the spinner abroad. Competition will settle those things. But if we are met in the same spirit here, if the cotton is bought here, if there is a demand for it here, there will at once come the question of whether that cotton is going to come to New England in competition with the rates that we always have assured in marine rates, or whether it will be used abroad. It rests with you whether you will use the round bale.

There is no question from the rates already secured that we have the advantage abroad. The railroads have met us very liberally and fairly. Of course they are all in these great organizations and cannot act separately.

I am invited to appear next Monday at Austin, Texas, before the railroad commission, as they have thoroughly investigated the round bale and want to consider it in connection with the rates, and we shall have a hearing. That is the situation as regards the round bale business — that we are here, we believe, to be a fixture. As Mr. TOMPKINS has said, all we can do is to cut out the unnecessary matters, unnecessary handlings, unnecessary expenses. We put the bales in the very best possible shape for the mill; we cut out everything we can so as to effect a saving. Of course we have to buy in competition with the old methods and we have to pay a little higher price than the old people do, and naturally they are going to cut down the expenses. While at St. Louis we charge 12½ cents for compressing, in other places where there is more competition they charge 10 cents, and some others 7½ cents. Well, I guess our price will have to come down to 10, and then 7½, and then probably down to 5 cents before we get through, or I guess instead of going through two or three handlings some of those men will have to be cut out, and I guess after a while, instead of getting two or three pounds of loose out of the thing, we will have to come down where we will not be allowed to take out more than barely a sample. Now all these things are going to

result in competition. It is going to mean gradually, if this is the correct system—and if it is not some other system will come in; but we are all alive and we are going to try to meet it if there is anything better. All this is going to mean a cheapening of the cost of handling cotton, whether it is the round bale cotton or any other, and you will share in the benefit of that. And I do say, if you are sincere in your desire for improvement in the method of handling cotton and the useless waste and expense there is connected with it, we are deserving of meeting with your commendation and of your standing up to us, and if it does not cost you any more to get your cotton,—and it does not, it costs you really a little less—not any less than we can afford to make it go, because we are here to make money—but if we can make you all these other savings and save you a little bit on the cotton, I say that as long as we have got any cotton left we are at least entitled to a share of your patronage.

Now just two points more. The first is that something over 5,000 bales of cotton were sold in the Boston market last year, and we have never had a claim of a cent, either in the matter of the little difficulty that there was in unrolling—although we guarantee that—never a complaint of so much as a pound of cotton less than the invoice weights, and never a claim of any sort for anything in the bales, although we did find one bale in the very beginning that somebody had dropped a pair of gloves in, which was done, as we found, for a purpose. We never had a claim for anything as to grade or character of cotton or method of packing. I don't know that you can ask any better proof than that. The other point was as to the damage to cotton at the centre of the bale. Originally we had a square screw core at the centre, and for the first five or six hundred bales of cotton that were turned out we used that; but on unrolling a bale at the beginning I found that that was cutting and damaging at the edges. Just as quickly as we could get some twenty or thirty of those cores made up with wave screws instead of a sharp edge, we did away with the square screw core. I do not think any gentleman can produce a case of cotton that has been

damaged by abrasion at the centre, since that was done. The question has come up as to what Mr. TOMPKINS said as to delivery of the bale without having to undo any of the processes. I believe that the bale as it stands there can be unrolled where it will run directly into the machinery without undoing any of the processes. Certainly the wrapping, which Mr. TOMPKINS said it was desirable to do away with, can be used for other purposes and can be used again. In conclusion, Mr. President, I will say that I do not think it is necessary, but if any of the gentlemen are doubting in regard to the matter, if the Association desires that one of those bales should be unrolled, I shall be very happy to do so.

Mr. FRED C. MCDUFFIE. Will you give us a little information as to the number of plants you have and capacity to put up these round bales?

Mr. D. C. BALL. Gentlemen, two or three years ago two or three of us who were in the cotton business and believed in this method, put our own money into it and we put up six plants. After we had very thoroughly demonstrated what we could do others became interested with us, who had possibly no greater knowledge of the business and no greater interest in it; but they were not going to put a large amount of money into this until they were satisfied themselves. The result was that the past year we did not increase our plants. But having gotten far enough into the season to demonstrate the fact that there was no longer any question, that the new bale was inevitable, as the saying is, they purchased their own foundry in Chicago. We have that now. We have just completed the first order of 25 of those presses, and on Monday the board ordered 25 more. Now we shall have 50 presses in operation this year, at least; if we can complete more in that time we will do so. Then there came the serious problem of getting those plants into operation. With all the best management that we could secure we did not believe that we could go to work and erect 50 plants in the South. In the next place there came a great hue and cry about the question of monopoly. After careful consideration our

board has decided, so as to get a sufficient number of these plants into operation, in addition to what we could put up,—that under proper conditions, where they can secure a first-class, honorable ginner who will be bound by our requirements, who has acceptable machinery, who will work under our supervision, whose responsibility for the bale and for the sample can be absolutely assured, and the methods that we have adopted will be carried out, we will put one of these presses in his plant and allow him to make those bales of cotton under a thorough, rigid system of inspection and record under our superintendence, and we will first guarantee him a market for that cotton. We are going to buy it on the basis of net cotton, too; we have got to do it. We can sell it abroad for net cotton; it is to the foreign spinners' advantage. I am not a spinner, but I know enough of common-sense business to believe that it is to your advantage, too. Now we are going to buy that as net cotton, and further than that, we are going to pay back that dollar rental if we buy that bale of cotton.

Now here comes one point that I say to you, gentlemen. You can buy that bale of cotton, if you want to buy a round bale, through us, but if you are interested in getting this system thoroughly spread — incidentally you do make us the rental on that press — but if you are interested in the rapid introduction of that process, then if you will instruct your agents, the buyers down there, to buy the round bale cotton on the same basis net to you, with all the savings there are in it, as the square bale of cotton, it will facilitate our business very largely. We are perfectly willing to forego the profit that we will get out of handling the bale of cotton to secure the rapid introduction of the entire system. We are perfectly willing to let these 50 plants and as many more as can go in, go and operate and make the ginning profit and the saving in bagging and ties and incidental saving, and leave anybody else that will operate on the proper system and the proper protection, to operate the plants. Now, if you gentlemen want to buy that bale of cotton and want to buy it of us, we shall be happy to supply you with as many bales as we

can put up. But you can help us by having your agents down there understand that the round bale with all these safeguards and protections is the bale that you will take, and if you will take it through them it will remove all this cry that has been raised against us, for which there is no reason. The fact of the matter is that we do hold some very strong patents on the process, but the fact is, we are not stupid enough to think we are going to handle the whole cotton crop.

Mr. D. A. TOMPKINS. Mr. BALL, do I understand that you propose to license 50 or more ginners and let them sell cotton to any cotton works, the cotton manufacturer to simply direct his agent to buy from any of these ginners and not have to buy it through you at all?

Mr. D. C. BALL. Yes, sir, provided that ginner is a responsible man that will assume the responsibility.

Mr. D. A. TOMPKINS. Do you undertake to guarantee that the men you license will be responsible?

Mr. D. C. BALL. Well, I don't know that I can answer that directly. We will undertake —

Mr. D. A. TOMPKINS. What I mean to say is, your proposition is to license only people who, in accordance with your judgment, are responsible?

Mr. D. C. BALL. Yes, and who will undertake to handle this business under our supervision.

Mr. D. A. TOMPKINS. And if the cotton is not bought through you the ginner pays you one dollar a bale rental?

Mr. D. C. BALL. Yes, sir. We use the figures one dollar a bale; it means so much a hundred.

Mr. D. A. TOMPKINS. But the cotton can be bought from a number of ginners aside from your company?

Mr. D. C. BALL. Yes, sir, if they have our presses.

The PRESIDENT. I would like to ask, Mr. BALL, what experience you have had in exporting these round bales? You spoke of the exportation.

Mr. D. C. BALL. Well, sir, we have refused to let a bale of cotton go thus far. Last season, as soon as some question

arose in regard to hard centres, we had in mind an experimental shipment that was made, I think it was three years ago, to Liverpool by the first company that undertook this business on an extended scale, the old Bessonette company, I think it was. The cotton was sent over there, and without any particular friends or anybody to look after it, it got rather a hard name. We made up our minds that we were not going to let a bale of that cotton go practically out of our reach until we knew just what we could do. During the past seasons we have had certainly half a dozen of the largest exporters come to us for a lot of that cotton. We are going to send abroad a large amount of this cotton now very shortly and have already had overtures from seve.al of the large concerns abroad to undertake the handling of it, and are in correspondence now with some of the foreign associations, and when we undertake it we shall do it very carefully. In connection with what was said about Japan this morning, sir, I will say that I do a large business with Japan myself with the old square bale, and the same organization that I do business with has been after us for the last five or six months for a lot of this cotton. Now that we have the cotton in such shape that we can absolutely guarantee it, we are arranging to send a shipment to Japan.

Mr. JOHN ECCLES. Mr. President, the two principal points that I think Mr. BALL tries to make are the tare and the saving in freight. Are those two of the principal points or the two essential ones he makes in the round bale?

Mr. D. C. BALL. The actual saving in tare itself is perhaps 18 to 20 pounds. We all know that there are practices that at least it is not becoming in me to discuss. I know the cotton business pretty well. But the actual saving in tare, as I say, is from 18 to 20 pounds. We all know what a guarantee within one per cent. of the weight means. No matter how much a man may hesitate to do it, the customs of the cotton business, as we all know, and as has been stated publicly in your meetings before, are such that "practically every bale of cotton we use loses five pounds from the invoice weight at the time it gets to

the mill." We guarantee this bale against it; first, because there is no stealing from the bale. In the next place, we had to face the problem right in the beginning, are we going to add on the usual three pounds to the actual weight of the invoice, or are we going to give the actual weight? We settled it by specifying the actual weight, which we guaranteed. It cannot dry out any. We put some in an upstairs warehouse near the roof, from November to the 20th of June, when we re-weighed it and it had lost less than one pound. Now of course that saving in freight on the weight from Texas, where the net rate is one dollar, or including compressing, one dollar and ten cents, that means a saving of about twenty cents. Gentlemen, that is one of the things that we have in mind when we say that we want you to buy that bale of cotton; we want to make that saving, or so much of it as we can. Now so far as the freight matter is concerned, as I have stated, the railroads of this country are in these big organizations, as you know, and they are held pretty fast and no railroad can openly make a rate different from the regulations without getting up a fight, and under the new arrangement the gentleman that does it usually gets into very serious trouble. But a great deal of cotton comes to this part of the country by water. The ships are not bound by any such regulations and they can make in black and white an offer of anywhere from 20 to 35 per cent. cut in the rates, and they are going to get that bale of cotton unless the railroad meets it, and the railroad does not usually lose freight by that means if it can help it. The result, of necessity and plain common sense, means that there will be a big cut in the rates as compared with the present rates, because the average car of uncompressed cotton carries about one-fourth its ordinary load, or about 13,000 pounds in a 40,000 or 50,000 pound car, perhaps the average load of compressed cotton is 26,000 pounds. We can load, as I say, anywhere from 60,000 to 65,000 pounds in the same car, and competition will very quickly settle that. Besides, if the railroads were not inclined to be fair with us about it, we have first, as I say, the water competition, and second, we have the commis-

sions, both the Interstate Commerce Commission and the others. But I mean that the plain common sense matter of the pockets of the owners of the railroads will settle that matter if the freight agents themselves do not do it.

The PRESIDENT. Any further questions to ask Mr. BALL?

Mr. ARTHUR H. GULLIVER. How much wear is there in shipping on the covers of the round bale? We had a few last year, and if I remember rightly, some of them were torn. Now that bale will not stand the hooks without damaging the burlap, or whatever it is that protects it. Is there any guarantee that that covering will be in shape so that it will cover the bale when it gets to the mill, or do the handlers as it is carried through use it as they please? Of course I understand if the bale is put in a car and sealed it will be all right when it is delivered at the mill; but is it going to be possible to get all bales delivered in that way?

Mr. D. C. BALL. I will answer the gentleman in this way — rather indirectly perhaps — by saying that we propose at the principal ports and gateways where we do business — and we do not propose, I will say here, to put out these presses indiscriminately where we cannot supervise them and where the business will be handled carelessly; but on all cotton that the American Cotton Company handles we propose to have an inspection of the loading. We have accomplished it thus far. Incidentally I will say that I have done the same thing myself for several years in the old square bale and checked all loading and handling of the cotton, and I found it saved me money to do it. Now with that inspection we shall immediately have a check upon the loading with the railroad. When we seal that car there is no reason that I can see, or method by which the covering of that bale of cotton can be torn. If it is to be rehandled at St. Louis, Cairo, Memphis, or other gateway, it is cheaper for us to have a man there to do that checking and sealing than it is to let it go. We propose doing that. At Houston and Galveston and New Orleans we shall do the same thing. I will say another thing, gentlemen, I have had some

experience, like the rest of the men in the cotton business, with claims. Now you gentlemen will not take any offence, I am sure, at my saying that in addition to the vast number of just claims, there are some unjust claims. Now we propose having, for the security and satisfaction of the mills as well as ourselves, as thorough a settlement of that as possible. I have suggested merely — I did not want to go beyond what were the proper limits — I have suggested merely that it was possible for this Association to at least undertake if not carry out some method by which all these questions of grade and character of cotton, weights, etc., can be determined. I believe that it can be. I do not believe it ought to be left as a matter of adjustment simply between every individual mill and the man that he buys his cotton from, no matter where he may be situated, all over the country. You know what the result is. The good men pay their claims and the poor ones don't. One of our requirements, one of the things that goes on every label of a bale of cotton is, "The moment that you find anything the matter with this bale of cotton, notify the agent who sold it"; and on investigation, if there is anything wrong we will pay the claim immediately and go back on the railroad for it. That is an indirect answer to your question. If it is anything that we are responsible for or that we can protect you on, we will do it.

The PRESIDENT. Mr. MCDUFFIE, do you wish to ask Mr. BALL any questions? Any other gentleman? I think I would like to ask Mr. LEAVITT, representing the railroad, if railroad companies are ready to handle these heavily loaded cars?

Mr. T. F. LEAVITT. I will say that the capacity of cars has been stated here at 69,000 or 79,000 pounds, and I do not think it would be good railroading to load it up to the weight of 70 odd thousand pounds. The growth of cars has been like everything else, it has been growing larger and larger and the freight smaller and smaller; and now if any party wants a car they want a car which is about three times as big as the one they used to have a few years ago, and that is the car which has up to 60,000 pounds capacity, the largest except a few special cars

made for a special line of freight. If you undertake to load those cars 70,000 pounds, you see there will be trouble immediately.

The PRESIDENT. Does any gentleman wish to discuss this question further?

Mr. O. S. BROWN. This question has come before this Association several times, something after this manner. I believe we are all very glad to hear it discussed, but I think we have begun at the wrong end entirely, sir. I doubt if there are half a dozen men here in the room who have anything to do with the buying of the cotton. They can kick just as much as they have a mind to, but they cannot always bring about a change. I think it would be a good idea if this same Mr. BALL could by any means get before the Arkwright Club and give the same talk there that he has given today. I think it would be very much farther reaching, and I trust he will be able to do so. For if all he claims is true, certainly we cotton spinners would be very glad to have it.

The PRESIDENT. We have further on our program a paper by Mr. HERBERT L. PRATT, on "The Paul System of Drying."

THE PAUL SYSTEM OF DRYING.

HERBERT L. PRATT, Lewiston, Me.

I suppose all will concede that yarns or fabrics dried at as low a temperature as possible will be softer, smoother, and that the tensile strength will be increased. This the Paul system does by reducing the pressure of steam by removing water and air. By the removal of water and air steam flows to cylinders without opposition, making all the heating surface effective. Where there is water in the cylinders it acts as a condenser, and a large amount of heat is carried away by the water. The air itself acts as an insulator, as air, either hot or cold, is a bad conductor.

The hot air also takes the place of steam and prevents steam flowing in freely, and being non-condensible gives out heat only in a slight ratio as compared with steam, hence when air and water are removed you need only fill the space with dry steam, and that steam does not require pressure. The carrying of pressure on the cylinders and dry cans is bad, for the reason that they are made of such length and diameter that they cannot stand the pressure and it gets them out of line, and requires the trunnion boxes to be packed tighter and more power is required to drive. With the low pressure there is no leaking or dripping around the trunnion boxes and all runs freely.

By the use of the Paul system it is utterly impossible to collapse the cylinder because the water is removed and pressure is reduced to so low a point. Always where there is water in the cylinder there is danger of collapsing. To explain this system, there are on the return trunnions of each cylinder, air

pipes of ¼-inch diameter that lead into the air pipe main. Close to the trunnions in each air pipe is placed an air cock or separator. The air pipe main is ½-inch or ¾-inch diameter, according to the number of machines connected. A vacuum is maintained on the air pipe main by means of a steam ejector or a rotary exhaustion device, as best suits the convenience of the party using. The average vacuum maintained on the air pipe is 15 inches.

On our slashers, which are one cylinder type, 72-inch diameter, where we formerly had to carry 10 to 12 pounds of steam we now run with 1½ pounds, and can do when occasion requires, 10 to 15 per cent. more work. By weighing the water before the system was applied and afterwards it showed a saving of 10 to 15 per cent. in steam consumption. On our dry cans we formerly carried 12 pounds. Now we run at atmosphere, doing the same work, and the most delicate shades of yarn are not injured at all by running over the cylinders at this low pressure. The heat is so slight the colors are not affected by it at all. These cans are available for work as soon as the chains are ready, and are not stopped for any cause during the entire day other than taking chains off or putting on. If occasion requires we can do 10 to 15 per cent. more. When we stop these cans to put on chains the steam does not require shutting off. The heat of the cylinders does not vary from one end to the other, that is, you can dry on one end as fast as you can on the other. To satisfy myself that water was being removed from the cylinders, I had the machine stopped and the man hole head removed, and an examination made, when we found no water there at all. All the water is taken back and is used for boiler purposes.

The system is simple, requiring little attention, and does not get out of order. Operatives readily understand the working of it.

Mr. STEPHEN N. BOURNE. Mr. President, that ¼-inch pipe about which Mr. PRATT talks comes out of a 3-inch discharge pipe from the cylinder, and has a plug-cock in it. Around the plug a V is cut about the depth of a pin, which allows as much steam to escape as would come out of a pin hole. I would like to ask Mr. PRATT what good that ¼-inch pipe is going to do?

Mr. HERBERT L. PRATT. To answer the gentleman I will say that after running it one week we took off the man-hole head and went in and not a drop of water was found. That is all the good we found it has done.

Mr. STEPHEN N. BOURNE. That is all very true, but you don't have any idea that that pin hole did it?

Mr. HERBERT L. PRATT. Yes, sir, nothing else; nothing else.

Mr. STEPHEN N. BOURNE. Well, look here, I tried that and there is nothing in it. You may change your piping over — I don't doubt you are doing just what you say, but it is not that pin hole that does it.

Mr. HERBERT L. PRATT. What does do it?

Mr. STEPHEN N. BOURNE. The change you made in your piping, probably.

Mr. HERBERT L. PRATT. That is the only change we made in the piping on the return.

Mr. STEPHEN N. BOURNE. I know, on the return — that is where the trouble was. You ought not to have any water in your cylinder. That pin hole doesn't take any water out of your cylinder.

Mr. HERBERT L. PRATT. What do you have pressure on there for?

Mr. STEPHEN N. BOURNE. To get steam into the cylinder.

Mr. HERBERT L. PRATT To drive the water out.

Mr. STEPHEN N. BOURNE. It is not necessary to have much pressure. If your cylinder is properly constructed, the buckets take the water out.

Mr. HERBERT L. PRATT. We run with a pound and a half.

Mr. STEPHEN N. BOURNE. We can run with a pound and a half and have no water in our cylinder.

Mr. HERBERT L. PRATT. What do you have your trap on there for?

Mr. STEPHEN N. BOURNE. We don't have any trap.

Mr. HERBERT L. PRATT. The cylinder comes to you with a trap on.

Mr. STEPHEN N. BOURNE. I don't want any trap. I want the circulation to go through. I want to say, I think that is one of the humbugs that are before us today. It was represented to me that they had got it at Lewiston, and I put it on on the strength of what they had done at Lewiston. I didn't want Lewiston people to beat me. I put it on and tried it. The man was going to save me one slasher out of nine. I thought if he could do that I would be satisfied. But we could not do so much work within 10 per cent. as we could without it. It is on there now, but not in use, and if I had seen beforehand what he was intending to put on, I would never have allowed him to do it, for I do not believe in that pin hole arrangement.

Mr. JOHN W. ARRINGTON. Mr. President, I have recently had some correspondence with the firm of Warren, Webster & Co., of Camden, N. J. They claim to have an appliance for doing just the work covered by this paper, and if the question is proper I would like to ask if any member of the Association has used their system? If they have used it I would like to know if they have had satisfactory results.

The PRESIDENT. Can any member answer the gentleman's question?

Mr. CHARLES H. FISH. I have used the Warren & Webster system, not in connection with dry cans particularly, but for taking care of the water of condensation from a low pressure system. We had some dry cans, quite a number of them, that were not doing satisfactory work. We increased the steam outlets and steam inlets at the same time, and ran the water of condensation into a Webster open heater — any type of open heater would do, although I believe WEBSTER now holds the patents. The Webster open heater, by condensing the steam does as a matter of fact often maintain a slight vacuum of an

ounce or two, I think. In the Paul system, I think, as used by Mr. PRATT—I am not sure—may I ask you, Mr. PRATT, if you do not use a Webster heater in connection with your system?

Mr. HERBERT L. PRATT. I do on circulation, but this I spoke of is on the dry cans and cylinders.

Mr. CHARLES H. FISH. In the Webster system as I have used it and am using it, there is no claim or desire for vacuum particularly, any further than a free delivery of condensed water from cans.

Adjourned to Thursday morning, April 29th.

THIRD SESSION.

THURSDAY MORNING, APRIL 29, 1897.

Meeting called to order, President LOWE in the chair.

The PRESIDENT. The first paper is in reference to the Lowell Textile School by its director Mr. CHRISTOPHER P. BROOKS.

THE LOWELL TEXTILE SCHOOL.

C. P. BROOKS, Lowell, Mass.

One year ago in this hall and before this Association, Mr. FRANK P. BENNETT concluded a paper on "Textile Education in Public Schools and Special Institutions in Massachusetts," by stating that he might have properly patterned it after the celebrated Hibernian essay upon reptiles in the Emerald Isle, the subject of which was "Snakes in Ireland," and the essay itself consisted merely of the statement "There are no snakes in Ireland." He justified the reference by stating he might have confined his paper upon "Textile Education in Public Schools and Special Institutions in Massachusetts," to the explanation

"There is no textile education either in public schools or special institutions in Massachusetts." He added: "While this is true today, we hope and believe it will not be true two years hence."

That belief was well founded, for within one year the first textile school in New England has been established and has already been in operation for some months, and it is no longer true that "There is no textile education either in public schools or special institutions in Massachusetts."

The institution, subject of this paper, has been the result of much energy and public spirit displayed by many of the citizens of Lowell, Lawrence and Boston, and particularly on the part of a few. Its formation has largely been aided by the good work done in its favor, and warm advocacy of the school by many of the textile papers, and not a little by the papers read and discussions originated at the fall meeting of 1895, and the spring meeting of 1896, of the New England Cotton Manufacturers' Association, when the subject of technical instruction was thoroughly ventilated.

The textile school of Lowell is controlled by a corporation known as the "Trustees of the Lowell Textile School," and is incorporated by a special act of the Massachusetts Legislature, "for the purpose of establishing and maintaining a textile school for instruction in the theory and practical art of textile and kindred branches of industry."

The incorporators, with two exceptions, represent either as president, director, treasurer, agent, or superintendent, the management of great textile corporations of Lowell, Lawrence and vicinity in the Merrimack Valley.

By the terms of the by-laws, at least three-fourths of the trustees must be "persons actually engaged in or connected with textile or kindred manufactures." This insures the practical character of the management and instruction.

The contributions towards the equipment of the school have been made partially by the State of Massachusetts, partially by the city of Lowell, and partially by the manufacturers of textile fabrics and textile machinery.

The funds at the disposal of the trustees have been carefully administered, and in order to avoid too great a drain upon them, a special building has not been erected, but space has been rented in a block possessing almost all the requisites for a school of this kind, in the fact of its being in a very central position, conveniently situated for access from all parts of the city, near to the terminus of the electric car lines from Lawrence and Nashua, and contiguous to one of the railway stations, in being of mill construction throughout and substantially built for the reception of heavy machinery. Possession was only taken in November last.

The space taken in the first instance was soon found to be insufficient for the large amount of machinery necessary to thoroughly equip a school of this character, and additional space was taken, doubling the capacity of the school, with the option of using still further accommodations as required. The floor space at present utilized is about 25,000 square feet.

The machinery and plant of the school may be divided into several sections, foremost being the cotton picking, carding, combing, spinning, twisting and warp preparation department.

The equipment of this department, as regards machinery, consists of an automatic feeder, single section picker, finisher lapper, one top flat card, one revolving flat card, railway head and drawing frames, one slubber, one intermediate and one fine frame, also a spinning frame, a spinning mule, a reel, wet and dry twister, spooler, warper and slasher.

There are, in addition to the above, additional machines for yarn testing and other purposes, and a good line of full size models of machinery. This machinery, like all other in the school, is entirely new, with all the latest improvements, and the firms represented by it are the Lowell Machine Shop, The Whitin Machine Works, The Kitson Machine Co., and T. C. Entwistle.

The second department, that of wool picking, carding and warp preparation, is equally well equipped, and consists of a complete collection of woolen spinning machinery and auxiliary

machinery from the establishment of the Davis & Furber Machine Co., Geo. S. Harwood, The Torrance Mfg. Co., B. S. Roy and others.

In this room are to be found the mixing picker, the first breaker card, the second breaker card, the finisher card, with which are the Bramwell feeds, Torrance baling head and Apperly feeds, one spinning mule, one warp spooler, one warp dresser, one beamer, one twister and a grinder.

The worsted machinery, which has not yet been put in position, will be erected in the same room and will consist of all the machinery necessary to produce worsted yarn from the raw wool.

The operation of the school is not confined to the manipulation of cotton and wool, but there is also an excellent collection of silk machinery from the machine shop of the Atwood Machine Co., Stonington, Ct.

One of the most complete rooms in this school, or in fact in any school with the same objects in view, is the weave room, where there is a collection of 42 looms for the manufacture of cotton, woolen and silk fabrics, including 20 hand looms and 22 power looms on which any fabric that it is possible to weave can be made. The power looms are almost all different and represent some of the best productions of the Crompton-Knowles Loom Works, The Lowell Machine Shop, The Whitin Machine Co., The Draper Co., and others. There are throughout the whole school a number of additional machines, such as quillers, spoolers, beamers, yarn reels and testers, which are used in the course of construction.

The power is derived from electric motors, the lighting is by electricity, and there is an excellent system of fire protection and of humidifiers.

The equipment of the school consists of high grade machinery with all latest improvements, specially built to afford facilities for all kinds of experimental work, and of such variety as is seldom found in any one textile mill.

In engineering this work, it has been borne in mind that the

whole plant will be used for educational purposes, and therefore different systems of fire protection, lighting, humidifying and power plant have been used in different rooms, so as to give the students an opportunity of comparison and of wide experience.

In the school there is the beginning of a textile museum and the nucleus of a textile library which now contains 140 volumes, not the least useful of which is a complete file of the proceedings of the New England Cotton Manufacturers' Association, and another of the bulletins of the National Association of Wool Manufacturers.

The object of the school is to give instruction in the practical knowledge necessary in the cotton, woolen, worsted and other textile industries, in science and art, as applied to these industries, and in the processes and methods for the purpose of improving any special trade, or of introducing new brahches of industry. It is essentially a trade school, and the whole plan provides for such instruction only as will be found useful in textile trades.

Science and art are taught, but not with the object of educating professional men, but with a view to industrial and commercial applications; but the school offers to graduates of universities and scientific institutions an opportunity of technical instruction in the practical application of certain branches of science.

The staff of lecturers and instructors consists of men who, in addition to their special experience in textile school work, have been for years practically engaged in mill work, and it is the object of the trustees to give technical instruction that shall be equal to that of the best European schools, and at the same time of a thoroughly practical nature.

The operation of the school is in three directions:

First, day classes. These are specially intended for the instruction of young men whose intention it is to enter the business of textile manufacturing in any branch, and who have not been engaged in a textile mill, or who have already been en-

gaged in such business and wish to improve their knowledge and opportunities, and who are able to devote their entire time to study. The complete collection of machinery enables every process to be practically illustrated.

The second branch of the school work is intended to give thorough evening instruction to those who are engaged during the day in mills and shops in the Merrimack Valley, to enable those who wish it, to perfect their knowledge of the branches in which they work, to acquire knowledge of other processes than those in which they are engaged in the day time, and, in the course of several winters, to obtain a thorough technical education at a low cost, and without interfering with their daily labor.

The third means of encouraging textile instruction is by a course of popular lectures. These lectures are given by recognized authorities in the branches of which they treat and afford an opportunity to the students in the school, and inhabitants of Lowell and district, who do not care to take a regular course, to attend popular illustrated textile lectures.

The instruction given during the last few months has been preliminary to further instruction which will be given to the same students in two succeeding years, and the students have so far practically all taken the same course of instruction. The number, however, has grown so large, and there has been such a demand for special courses, that at the beginning of the fall term these students and others who enter the school will be given the option of three courses: cotton manufacturing course, woolen manufacturing course, or a designing course, and thus the needs of most of the branches of textile industry will be met.

The establishing of chemical, dyeing, bleaching and finishing departments are under consideration and will be introduced as the student advances in his studies and is ready to take advantage of them.

The key-note of the work of this school is intended to be "thoroughness." Nothing is treated from merely a theoretical point of view, everything is illustrated practically. The system is such that no student is allowed to pass forward to a new

machine or new study until he has thoroughly mastered the one on which he is engaged.

It is hoped to make for the school a reputation by the excellence of the results rather than by producing a large number of imperfectly trained graduates, and that in the future the development of the Loweil Textile School will be co-incident with and have an influence in assisting to develop a new era of prosperity in New England textile manufacturing, in helping to introduce the manufacture of those textiles which are now imported from abroad to the extent exceeding $100,000,000 worth annually, and that in case of the manufacture of the coarser fabrics being transferred to the Southern States, it may help in the introduction of finer and more elaborate goods to take the place of the coarser.

That the school has been a long felt want is proven by the fact that there are now on the rolls of the school 151 students, and at least half as many more could not be accommodated when the school was opened in January last and are now awaiting admission at the full term.

This is not a suitable occasion for me to enlarge upon the advantages of a textile school or to enter upon a lengthy dissertation of the histoay, the scope, influence and numbers of foreign textile schools. This subject was admirably dealt with in the papers read by Mr. E. W. ATKINSON at the Crawford House meeting and by Mr. E. W. FRANCE and Mr. F. P. BENNETT at the last meeting in Boston, and by Mr. C. J. H. WOODBURY on several public occasions, which have been of great assistance in the promotion of the Lowell Textile School, and the members of this Association can help the school still further.

You are often consulted by parents wishing to place their sons in the mill business, or by young men who are anxious to enter the cotton trade, and in such case a word in recommendation of the Lowell School would be of mutual benefit.

The time is approaching when the textile business will be learned in such schools. The mill itself is an establishment for making cloth and not primarily for the education of would-be

overseers or superintendents, in fact from a combination of reasons, a young man often finds a difficulty in obtaining all the information that he desires in a mill.

The opposite is the case in the school where the primary object of the lecturers and instructors is to instill all the information possible, and there can be no doubt that three years judiciously spent in a school is equal to twice that time in a mill.

The Lowell School is undoubtedly only the first of a group that will be established in this country before the close of the century, and in this matter we shall in this country be able to profit by the experience of other countries who have experimented with technical education until they have found the most appropriate and suitable method to fit their case. In England, for example, the money available for technical instruction has been frittered away in a large number of insignificant schools, rather than one or two thoroughly equipped and well manned institutions, which should serve as textile universities, to which the student and the manufacturer alike could turn for information and assistance, and from which every year brainy textile men would graduate, whose influence and knowledge would be devoted to the further development of textile industry.

The Lowell School is not merely a local school, though it has by force of circumstances been located in one of the oldest and perhaps one of the most suitable manufacturing cities for the purpose. It still is a New England institution and not merely a local one, its advantages and the opportunities it offers are open to citizens of any other city, and in turn it claims the sympathy and assistance of all New England textile manufacturers.

The PRESIDENT. The Association is very glad to have this report of the condition of the school, and it would seem to me that it was very gratifying that it had made such a start with such a splendid equipment.

The next paper on the programme we will take up at once as Mr. DRAPER wishes to read it and has an appointment: "The Manufacture and Use of Spinning Rings," by Mr. GEORGE A. DRAPER, which will be read by Mr. EBEN S. DRAPER.

Mr. EBEN S. DRAPER. Mr. President and gentlemen, I want to say before I begin on this paper, that I have seen it myself for the first time within ten minutes, and while I am perfectly willing to be responsible for every statement in it, I want it distinctly understood that Mr. GEORGE A. DRAPER, who is the practical man, as you all know, in Hopedale, is the author of the paper. He is obliged to be away, having been gone now for some ten days, and I had no intimtation until a very few moments ago that I was even expected to read the paper.

Mr. EBEN S. DRAPER read the following paper.

THE MANUFACTURE AND USE OF SPINNING RINGS.

GEORGE A. DRAPER, Hopedale, Mass.

I have been requested to present to you a paper on the manufacture and use of spinning rings. Before taking up the definite subject it may interest you to hear in a most general way, a history of the early use of and changes in the spinning ring itself. This I have arrived at by glancing over the United States patents issued on spinning rings, as the United States is the original home of the ring spinning frame, and the machine has reached its highest development here.

The ring frame, so-called, was probably invented by Mr. JOHN THORP of Providence, R. I., who obtained a patent of the United States in 1828. The ring in this frame was substantially what is known as the common single ring of commerce to-day. It was however forced into a peculiarly shaped rail, and was wholly unadjustable.

This ring continued to be used in increasing numbers and without substantial change, except perhaps as to the rail which supported it, up to the early sixties, when various inventors began to work on the problem of adjusting it in the rail.

Among these early inventors were Mr. JOHN BIRKENHEAD, Mr. HENRY G. WALL, and Mr. J. W. WATTLES. Mr. C. V. MORSE invented adjusting the ring on top of the rail and without reference to the hole in it, in 1868. Then followed further and different forms of adjustment, until in 1872 Mr. S. S. SHOREY invented the plate holder, so-called, to-day in almost universal use.

Mr. GEO. H. DODGE appears to have first invented the traveller cleaner in 1852. This traveler cleaner was improved on by Mr. JOHN C. DODGE, who patented his invention in 1864. Later Mr. WELCOME JENCKES entered the field, having invented a traveler cleaner in 1866, and in 1881 he patented the so-called Jenckes cleaner, which has been largely used.

In 1879 Mr. THOS. COULTHARD of England, patented a traveler cleaner, used by us at present with the plate holder. This traveler cleaner is to-day in more general use, we think, than any other, and is at once positive and simple, and has no extra pieces.

The greatest improvement in rings that has been known, and the one that has revolutionized the manufacture of rings, is the invention of the double adjustable ring by Mr. W. T. CARROLLS, which invention was patented in 1869.

In 1866 Mr. JAMES HIGGINS invented a system of forging ring blanks without a weld. This system is at present largely if not universally in use.

There have been various ingenious and apparently useful forms of ring invented, but they have not taken deep root, and to-day the use of the standard double ring with plate holder and traveler cleaner is substantially universal.

Among the ingenious inventions above referred to are the Potter ring of 1867, improved by Mr. J. G. LAMB in 1874, which, although perfect in principle, has been found to be impractical in use. On this ring the traveler followed as it filled from the spindle or bobbin, out, and so theoretically gave an even drag to the yarn from the empty to the full bobbin. It was found difficult to adjust and very costly to run.

Various inventors have worked on changes of position or shape of flange of rings, but their inventions have not been generally adopted.

Mr. F. H. WHEAT, in 1878, patented an internal draft annulus interposed between the traveler and the bobbin, which promised good results, but which extended experiments showed produced no special advantage.

Mr. E. HARRIS, in 1880, invented a revolving ring, on the theory of reducing the surface speed of the traveler. This was found so complicated as to be impractical.

Messrs. EDDY, EVANS and other late inventors, have invented vitreous rings. It has been found impossible, however, to make them with sufficient accuracy and uniformity to produce good results.

In all there have been granted in the United States over 150 patents for various forms and styles of ring, which statement in itself shows that a large amount of attention has been given to the subject, and much time and money spent in producing the present high standard of manufacture.

One of the most important changes in the use of rings has been the recent use of considerably larger rings in spinning given numbers. For instance, four years ago the standard ring for spinning No. 30 warp yarn was 1⅝-inch diameter; to-day nobody orders a ring of this size, various manufacturers ordering from 1¾-inch to 2-inch.

I incline to think that Mr. A. F. KNIGHT has, more than any other man, been instrumental in making this change, and while, unfortunately for him, he has not obtained any pecuniary advantage from it, the advantage to the manufacturing public has been very great.

Coming to the manufacture of spinning rings, the ring of to-day is made, I think, generally from bar steel, drop forged into shape for turning. I present herewith samples of steel in the bar, partially forged, and the forgings. These forgings after being properly treated to destroy the scale, are turned. After being turned they are inspected, all substantially perfect rings going to the polishers, from them to the hardening furnace, again to the polishers, and finally to the inspectors. Rough turned rings, that is to say, rings with improper surface but within standard gauges of size, are ground, hardened and polished.

The finished ring of to-day should be a very perfect example of the mechanic's art. On account of the high speed of the spindle, and the larger size of the ring, manufacturers are con-

stantly calling for a higher degree of perfection in the ring itself. The whole course of manufacture must therefore be given close attention. The stock must be watched with the utmost care. We pay for our stock substantially three times the price at which we can purchase in the open market stock giving a similar analysis. We cut in two each individual bar of stock as it comes to our shops, and have and often exercise the option of returning this stock to the makers whenever in our judgment it is imperfect.

Great care must be used in forging the blanks from which the rings are turned, to know that the metal is not over-heated and yet shall fill the dies. This calls for the exercise of the highest skill. Any large excess of heat, or not heat enough, means a spoiled forging.

The turning machinery must be kept in excellent condition, and the tools in the very best condition, in order that the rings shall come within the limits of the standard gauges used by the inspectors. Our system of ring turning employs two tools working together, one on the inside, the other on the outside of the flange. This insures substantial concentricity of flange. It is not material if two adjacent rings vary in absolute diameter one-half of one one-hundredth of an inch, but if the flange of the ring shall vary from absolute concentricity one-half of this amount, the ring is worthless.

The hardening of rings is also of the utmost importance. Rings not hard enough, or unevenly hardened, will wear out rapidly. Rings hardened too much, that is to say, rings hardened at either too high a degree of temperature or exposed to heat for too long a time, become changed in character, the metal becoming granulous and rotten, and the surface becoming glassy.

It is our practice to test several rings from each day's hardening, and if, as we do occasionally, we find they have been injured, each ring is tested by springing, and the injured rings broken in the process are thrown aside.

The finishing of the rings is becoming every day of more and more importance as the art of spinning approaches more nearly

to perfection. At the present time rings of a standard of finish of a few years since, would not be accepted by any manufacturer. We have within the past year more than doubled our machinery plant for the finishing of rings, and at the same time have reduced our production one-third to one-half. One man to-day finishes about one-third as many rings as he finished three years ago, and the ring as it comes to him from the hardening furnace, is much better than it was then.

The inspection of rings is in itself an art. Our rings are gauged with snap gauges of slight variation not in excess of two and one-half thousandths of an inch for concentricity of flange; are tested for hardness, for roundness, for smoothness of finish, and for general appearance. Our experience is that from 50 to 70 per cent. of the rings examined by our inspectors are approved. Two-thirds of the rings returned can be made acceptable by better finishing, a proportion of the balance can be made so as to present one perfect flange, and about 10 per cent. of the rings sent through to the inspectors are thrown away.

I will not presume to instruct the members of the Cotton Manufacturers' Association as to the use of rings. I can only call your attention to certain well known matters of practice, the observance of which will produce the best results.

The rings in use should be occasionally tested for concentricity with the spindle. Floors and frames change enough so that it is not uncommon to find spindles at least one-sixteenth of an inch out of centre of the ring, where this matter has not been attended to. If we should send out rings one-half of this amount out of round, they would not be accepted. And yet, if the spindle is one-sixteenth of an inch out of concentricity with the ring, the effect is substantially as bad as if the ring were out of round to that extent. Care should also be observed to see that the rings are level and kept so, otherwise the traveler must run up and down hill, and produce bad work and increase the wear.

As to the element of wear, a disadvantage (which is not controlling) of the introduction of larger size of rings which has been going on in recent years, is that the rings must of necessity

wear considerably faster, and it is also true that because of the increased size of the ring and the higher modern speed, the traveller drag has been increased of late years, and although a better quality of manufacture is obtained, rings must be ex-expected to wear out considerably faster than under the old conditions. It is impossible to make an estimate of the proper length of life of rings under modern conditions until we shall have had the experience of running large numbers for a sufficient length of time to obtain an average.

The PRESIDENT. Do any gentlemen wish to conduct a discussion upon this matter or ask Mr. DRAPER any questions? Topical question No. 85 was intended to touch upon this matter, and reads as follows:

85. Spinning rings: does anyone know how to make them, and how large is it advisable to have them on the different numbers of yarn to be spun?

It was hoped that Mr. A. F. KNIGHT would be present and present a short paper on this subject. As he is not here we will take up the next paper: "The Ring Traveler: Its History and Progress in the Spinning and Twisting of Yarns," by Mr. A. CURTIS TINGLEY of Providence, R. I., which, in the absence of the author, will be read by title by the Secretary and then incorporated in the Transactions.

THE RING TRAVELER.—ITS HISTORY AND PROGRESS IN THE SPINNING AND TWISTING OF YARNS.

A. CURTIS TINGLEY, Providence, R. I.

The first attempt to spin cotton by machinery was by WYATT in 1730. Eight years later LEWIS PAUL patented his rolls, the first to be used in the drawing of cotton. One hundred years later the ring spinning system was adopted, a system that has revolutionized the art of cotton manufacturing.

The ring traveler being an American invention cannot be referred to as historical in the true sense of the word, for it was invented in 1838, and, therefore, came into use while some of the members of this Association were yet young; and yet, it has a history, for, coming as it did when a new throstle frame was found inadequate, it was frowned upon, but owing to its production being largely in excess of that of the throstle, it superseded it, though it was not adopted at once by some of the large corporations, for not until 1857 was it first used by the Pacific Mills, Lawrence, Mass.

We cannot find mention of the ring traveler in any work published earlier than 1854, although SCOTT in his "Cotton Spinner," published in 1850, refers to ring spinning and shows by illustration a section of a frame with the rings in position. In 1854 BAIRD, referring to ring travelers in his work "The American Cotton Spinner," says, "A small steel ring called a traveler which is one-quarter of an inch in diameter, and having an open cut in it is the means by which the thread is wound."

We learn that at North Dighton, Mass., in 1837, during the

hard times of that period, a throstle frame was changed to a ring spinning frame. The travelers were made by hand from cast off watch springs and their cost was one cent each. The operatives, rather than ask the overseer for travelers which were kept under lock and key, bent pins to the desired shape. This reminds me that during the late unpleasantness with our southern brothers, some of them found it very convenient to make ring travelers from the wire of old hoop skirts, bending it with pliers. We are at a loss to know what they would have done had the struggle been in '97, fickle fashion having decreed no hoops for the gentler sex.

In 1839 a machine for making travelers was devised, and in 1845 a system of numbering was adopted. Previous to this time travelers of two different weights were made, samples of which were put in small bottles, one full, the other half full, and in ordering purchasers asked for "full bottles" and "half full bottles" as required. The weights of the travelers were so uneven that up to 1855, in order to correct this difficulty, it was at times found necessary to change the draft gears and even to increase the speed of the spindle, or reduce it, by putting on or taking off a lagging, the change of gears making the yarn finer or coarser. The travelers were numbered according to the size of the wire used, at that time the lightest traveler being about a No. 4, weighing 1½ grains each, while now they are made as light as $\frac{1}{10}$ of a grain each, and graded accordingly. They were tempered by stringing them on a wire and holding them against a rapidly revolving pulley covered with leather. Even as late as 1868 no process was known that would give a spring temper to a traveler, for, as many of you know, travelers had to sometimes be "taught to run" by spreading or stretching them so that they would not pinch the neck or web of the ring.

From 1838 to 1885 the travelers were made with a large bow or circle which gave general satisfaction on account of the low speed of the spindles, but in the eighties the adoption of the "top" spindle involved a change, and this was accomplished by reducing the circle and making the traveler wider. Previous to

this a wide traveler had been tried, which as a rule was found wanting, but the change of speed of the spindle from 7,000 to 9,500 and even higher called for a traveler having a very small circle and one that would run upright as much as possible. This was obtained by adopting the Wilson round point traveler.

This traveler was invented by Mr. H. L. PIERCE, of Providence, R. I., and was fully ten years in advance of the progress made in ring spinning. Following are some of the advantages claimed for the Wilson traveler. It can be made harder and yet slip over the flange of the ring without breaking; it runs upright on account of the rounding corners, thus bringing an even wear on the top of the horn or lip, giving the same tension as long as the traveler stays on. The reverse of this is true of a square point traveler, for it runs lighter when first put on, growing heavier as the cant wears the side of the lip. This soon causes the yarn to cut into the traveler, making poor yarn as long as it stays on the ring.

We now come to the "New Idea," so called, large ring and long traverse. Until this was adopted the round point traveler answered every requirement for fast speed. Since then we have often wondered "where we were at." It may be of interest to you to know that at a spindle speed of 7,000 revolutions per minute a traveler on a 1⅝-inch ring covers a distance of 33⅔ miles per hour.

In adopting the "New Idea," notably changing from 1⅝-inch rings to 1⅞ and even 2 inches and speeding to 9,500, the traveler runs from 53 to about 56½ miles per hour — the speed of a fast express train. Now, not only is the traveler obliged to run this 20 or 23 miles per hour further, but its weight is reduced to offset the pull between the bobbin and the traveler. Especially is this true where a poor or medium grade of stock is used, for we know of a mill that changed from an $\frac{8}{0}$ to a $\frac{15}{0}$, the number of yarn being 28. If you were in the habit of hauling with a 1,200 pound horse 5 bales of cotton to a load, and it became necessary to haul 10 bales to a load, instead of adding another horse would you think of reducing the weight of the

horse to 900 pounds and expect him to travel one-third faster? This is precisely what is expected of the traveler. A mill using a good grade of stock would not change more than three numbers and one mill is known where only one number was changed.

But if a traveler does travel as fast, and must be made lighter, when conditions ought to make them heavier, we fully realize that consumers require such a traveler, and we claim that the traveler of to-day meets the requirements, provided the rings are thoroughly smooth. The adoption of the burnished ring has been a great helpmate to the traveler. But, to our knowledge, no process has yet been devised to polish the rings as does the traveler itself during the first few months. Thus it will be seen that the traveler not only has to perform its own work but also that of burnishing the rings. We find a peculiar state of circumstances in the many mills that are changing to large rings. While many are troubled by travelers flying off, some start with very little trouble. Of the former we will take for illustration a mill that changed from 1⅜ rings, 5-inch traverse, to 1⅝ rings, 6-inch traverse, making No. 60 yarn. A traveler would not stay on over an hour when the bobbins were empty, and not over half an hour when the bobbins were full. On the empty bobbins the traveler would pull so hard that it would soon become heated, thereby drawing the temper, causing it to become soft and quickly wearing out. On the full bobbin the centrifugal force of the yarn in ballooning when the ring rail was down, would cause the traveler to wear out half way up to the circle or bow. The number of the traveler was $\frac{17}{0}$. The only way out of the difficulty was to use a heavier traveler and oil it, which as a rule would, of course, be out of the question. A larger bobbin having a diameter of ⅞ of an inch would have aided the traveler very materially.

The oiling was done by taking a block of wood 7 inches long, 1½ inches square, and cutting it in 3 steps. On the upper step, underside, a piece of flannel or spongy leather ½ of an inch wide, was tacked. This was oiled from an oil can and the doffer before starting the frame after doffing it placed the oil against

the ring rail with the oiled flannel resting on top of the rings. This device oils the rings just enough to dampen them and can be run along the ring rail as fast as one can walk, and will not catch the ends unless it be too much cut out. Of course, we do not advocate oiling rings, but if it must be done in order to smooth them, this method may be used without staining the yarn. At this mill thorough tests were made with various styles of travelers, but as these tests were made during the very hot days in August, the results were not satisfactory.

We find that during a hot, sticky dog-day, especially on fine numbers, travelers fly off badly owing to the gathering of moisture on the rings. In this moisture the traveler runs hard, making a fine dust, which grinds it off in a short time. We wish to emphasize the fact that a high temperature with excessive humidity is without doubt the chief cause of travelers flying off. This difficulty would be largely offset by the use of a heavier traveler, if the yarn would stand the strain. It often occurs, where a mill is changing to large rings, that for a short time a coarser number of yarn can be spun, thus paving the way for the light traveler which is to follow. When this plan is adopted we seldom hear of any trouble.

It is not an uncommon thing to find spinning frames that have been changed to long traverse where the space between the top of the bobbin and thread guide is 1¾ inches and even less. It should be 2½ inches, or better still 3 inches, in order to insure good spinning.

Travelers have been made having one horn or lip unlike the other, and we will give a description of two of them. The elliptical, convex and concave traveler was made elliptical in shape, the convex or rounded horn being put over the flange of the ring, forming, we might say, a half round pointed traveler. The concave lip or horn fitted the circle of the ring on the outside. In the other traveler of the same idea the horn on one side was one-half longer than the other, the long horn running inside of the ring.

Another style was made having two travelers about an inch

apart, connected by a wire and made to conform to the circle of the ring. It was light running owing to the absence of a direct pull from the centre of the ring, but its cost and the difficulty of threading it prevented its use.

Another was made somewhat after the shape of a triangle, the principle of it being to regulate the tension according to the size of the bobbin. This was especially adapted for filling. It would cant over toward the spindle, thus reducing the centripetal force, or pull, when the ring rail was at the nose of the bobbin.

It will readily be seen that a traveler made to be put on in a particular way must possess unusual merit to be generally adopted, owing to the youth of the operatives found in some of our spinning rooms.

We are often asked to give a rule to determine the size of traveler for a given number of yarn, but there is no rule that can be applied to each case. For instance, on No. 28 yarn print cloth mills use all the way from a $\frac{4}{0}$ to $\frac{15}{0}$ traveler, according to the speed, size of ring, stock, etc., while these same sizes would also be used by other mills to spin from No. 15 to 70.

The stock used in the manufacture of ring travelers is specially imported from Sweden for this purpose, which country still continues to produce the best material for the very exacting requirements of the ring traveler manufacturer, where the rods are made for exportation to the United States.

It is necessary that great care should be used in the selection of these rods to secure only those of uniform quality and freedom from all foreign substances, as any inferiority in the quality or uniformity of the stock from the very beginning cannot fail to make its presence known in the finished traveler, as either the smoothness and finish or even the temper of the traveler may be affected by these conditions. Although great care is taken in testing this stock before it is drawn into wire, it frequently happens that a piece of wire which has passed every inspection and which to all appearances is right in every particular, will work its way through all the processes of manufacture until nearly the very last, that of tempering, when it will turn out

poor and thereby cause an entire lot, consisting of several hundred thousand travelers nearly finished, to be consigned to the waste heap. In this case the entire quantity from which this lot of wire was taken must be thrown aside.

It is probably true that in no other business in which wire is used is it so critically manipulated and in which so high a degree of perfection is required as for the making of ring travelers. The stock when it is received in this country is in the form of round rods of about one-quarter of an inch in diameter, and after being inspected is annealed to make it sufficiently soft for the first drawing, which reduces the rod somewhat in size, and this operation of annealing and drawing is repeated many times until the desired size of finished wire is obtained.

The last few drawings must be performed very accurately in order to arrive at precisely the correct size, and to determine this a very delicate micrometer gauge is used, which accurately records a variation of one ten-thousandth part of an inch, there being a difference of but one one-thousandth of an inch between the sizes of wire, and a sufficient quantity of all these sizes must be kept constantly in stock to enable the manufacturer to meet every possible demand at a moment's notice. This wire is kept in small coils, each carefully wrapped in moisture-proof paper and a powder to prevent rust from exposure, each of these coils containing a certain quantity and of a shape adapted to the winders.

The first operation in the manufacture of ring travelers consists of rolling or flattening the wire according to the size, style and weight traveler to be produced. This is accomplished by running the wire through a pair of hardened steel rolls which must be ground very smooth and accurate and must operate very slowly in order to bring out the wire of the exact dimensions required. In a short time these rolls begin to show signs of wear and must then be taken out and new ones put in their place.

After the wire has been rolled once it is taken off the reel and sent to the hardening room to be annealed, after which, when

cool, it is again sent through the rolls, this operation of rolling and annealing being repeated several times until the specified width, thickness and strength is obtained, and when this is finished the wire is again bound into small coils and sent to be annealed for the last time before cutting, after which it is ready for the traveler maker.

It requires a great amount of skill and patience to be able to take this wire in the round and roll it to certain gauges so that when cut and bent into travelers, twenty of them will weigh exactly the given number of grains, allowance to be made for loss of weight in the hardening, tempering and finishing processes. The scales used in weighing travelers are very delicately constructed and are sensitive to a hundredth part of a grain, and the weights used must be frequently tested to guard against any possible wear and consequent loss in weight.

Ring travelers are cut and bent on automatic machines, the various sizes and styles requiring the use of more than fifty different machines, as a machine that will produce one style of traveler is not adapted for another. Each machine must have its own complete set of tools which must always be kept in perfect order for immediate use. Each one of these small pieces of wire must be cut off by the machine precisely alike, as any variation, even if but a trifle, not noticeable to the naked eye, but discernible under a magnifying glass, will alter the weight of the travelers, and the workmen must keep continually weighing and examining them as fast as they are made so as to avoid any trouble of this kind which would spoil the lot.

As each little lot is weighed and examined for any imperfections they are put in a wooden box and properly marked, after which they are sent to the store-room, there to await the hardening. If wanted for immediate requirements they are taken direct to the furnace room, otherwise they are given a coating of oil to keep them from rusting, and placed in stock to be used as required.

Travelers in this condition are expressed as being in the "soft" and are about half finished. A large quantity, several

hundred millions of these "soft" travelers of the regular sizes and styles are constantly kept on hand ready to be hardened and finished as necessity demands. In addition to this a large quantity of each size, aggregating over five hundred millions — a sufficient quantity to supply the entire world for a year — must be kept on the shelves all finished and boxed ready for immediate shipment. Care must be taken to keep these in a dry place, free from any dampness, otherwise they will rust.

The hardening process is probably the most important as well as one of the most difficult operations, which, combined with the tempering that follows, converts the delicate particles into steel of the finest grade having a watch spring temper. The travelers to be hardened are very carefully packed in layers with the carbon in small iron pots, and must be so distributed that each traveler will be covered with the carbon on all sides. When this is finished the pots are securely covered and sealed absolutely air tight and placed in the hardening furnace, where they are submitted to an intense heat for one whole day, after which they are taken out red hot and dumped in a solution to cool. The fires in these furnaces are never allowed to go out except for repairs, as the heat must at all times be kept at a regular temperature. Great skill and experience is required in this part of the work, as any miscalculation in regulating the amount of heat for all the different sizes would spoil the travelers into which so much labor has been put.

The travelers are then spread out in large, square pans and allowed to remain in a very hot room over night to dry, after which on the following day they are cleaned and inspected, preparatory to tempering. All travelers are not tempered the same hardness, there being a wide difference in opinion among spinners as to the proper degree of temper, but as a rule they are tempered as hard as possible and yet go on the ring without breaking. Some mills require them somewhat softer than this, while others prefer them extra hard, and manufacturers are now able to obtain their travelers tempered according to their requirements. Fine travelers of too hard temper are not satisfac-

tory, for the reason that being so brittle they break easily from the sudden tension of the yarn in starting the frames.

By continually experimenting very great improvements have been made in the method of tempering during the past few years, which insure greater uniformity, and corresponding improvements have also been accomplished in other parts of the work, which now being divided into classes each workman has only a certain part to perform and an established grade of sizes to make. In this way he becomes an expert in the production of those sizes and styles.

After the travelers are tempered they are rough and black and must be scoured for several days to smooth the edges, and as the travelers are now very hard this operation is an extremely slow one. When this process is finished they are taken from the scourer to the polisher, where they remain for several days more, going through a similar process as in scouring, and when the polish is sufficiently bright they are taken out and sent to the packing room to be again carefully weighed, the temper tested, and each lot is kept entirely separate throughout the entire process, and when finished, to prevent any error or mixture, they are marked with a small tag in each box, which tag is retained in the box until sold, when it is removed and the boxes sealed.

In addition to the hundreds of the regular sizes and styles, new and special styles to meet the ideas of spinners of some particular class of work are being constantly produced. During the past three years we have been constantly experimenting with different shapes and styles of travelers and rings, the principal thing being to find something that would run light after doffing, gradually growing heavier as the bobbins filled. In several cases the result has seemed almost incredible from one traveler and ring, the spindle running at a very high speed. In a number of cases travelers would run from one to three months without coming off, but after going to the expense of having rings made and getting out a sufficient quantity of travelers, the adoption of them on a full frame running in a mill has in each case proved a failure.

A ring traveler, the smallest article in use in a mill, plays a most important part. It performs a double duty, for it not only winds but twists the yarn as well. When one takes into consideration the speed it runs, the distance it travels — for at a speed of fifty miles an hour the entire circumference of the world, about twenty-five thousand miles, would be covered in less than twenty-one days — and the work it performs, it is certainly amazing. Given right conditions in which to perform this work the results cannot fail to give entire satisfaction.

The PRESIDENT. The next paper is upon "Ring Spinning," by Mr. ALFRED E. ADAMS of Whitinsville. Mass.

RING SPINNING.

ALFRED E. ADAMS, Whitinsville, Mass.

In setting up the spinning frame, the utmost care must be taken to get the bolster rails, as well as the steel rolls, level. The spindles should be plumb, and this ought to be accomplished without resorting to the use of paper under the bolster flanges.

The bolster should be a close fit in the rail, and no adjustment ought to be necessary. "This means correct workmanship when the machinery is built." It is often necessary to tip the spindles to bring them concentric with centre of ring. This is wrong, as it many times throws the spindles out of plumb. There should be no occasion for this. The lifting rods should be plumb, the ring rails made short, not over eight feet long, straight and level when fixed on lifting rods; spindles concentric with the centres of the holes in ring rails. All adjustments should be confined to the rings, if possible. When holes in bolster rails are larger than the bolster to allow for adjustment of spindles, it throws the spindles out of line, consequently affecting the length of the bands. This point is worth careful consideration. High speed means a greater state of perfection in machinery if the results expected are to be obtained. Spindles should not be adjusted to rings, that is, it ought to be perfectly practical on new frames to adjust the rings so they will be concentric with the spindles, whether the rail is at the top or bottom of traverse. The shoulder on the solid ring or cast-iron holder that comes in contact with the rail should be wide enough so that when the extreme adjustment is necessary, the shoulder

will cover the hole in the rail, and leave a smooth finished job. The solid or double flange ring with cast-iron holder, is the best. The plate holder *may be* a necessary evil in some cases, the use of which should be avoided when possible. The three-screw adjustment has several advantages over the plate holder. No manufacturer of spinning rings has ever been able to invent a process whereby all the rings will be round, when properly tempered. In using the plate holder you can overcome very little, if any, of this imperfection in rings. Further, the plate holders are constantly getting out of place. With the three-screw adjustment a ring out of round can be brought so nearly into round that the set will show it to be practically perfect, and the fact that it will stay where you leave it is of great value to the spinner. A solid ring, or double flange ring in cast-iron holder is clean and neat. The plate holder is a dirt catcher. The writer is aware that many things have to be done with old machinery that would be utterly impracticable on new. Yet it may be proper and necessary, under the circumstances, in order to get a larger production.

The roving traverse should have careful attention. It should travel a little quicker at the ends when changing direction; it should lap in the centre on long boss rolls to avoid a shoulder forming on the top roll. Rings and spindles cannot be properly set, and when started cannot give satisfaction, unless the frame is built right and set up in the mill so that the different parts are fitted properly, made level and plumb, especially such parts as relate to the spindles and rings, the most vital parts, especially when running at high speed. The manufacturers of spinning rings are blamed many times when the fault is wholly with the machine, either in the adjustment at the mill or the imperfections left by the machine builder. Often the men sent out to set up machinery are deficient in ability, or the amount of labor required of them is so great that they are obliged to slight their work in order to turn off an amount that will be satisfactory to their employers. Greater perfection is demanded in machinery

in order to produce the quality of yarn and goods demanded in our markets to-day.

Are not the manufacturers of cotton goods and the manufacturers of cotton machinery in the same boat? Cannot one assist the other? If the manufacturers of cotton yarns and goods will demand a higher state of perfection in their machinery, and share the expense of such high state of perfection as it seems necessary to have, will not the manufacturers of cotton machinery co-operate with them, and will it not pay?

Let us turn our attention to the starting up of ring spinning. In starting spinning frames, when new, many things suggest themselves to the really practical spinner, for he very well knows that competition is keen, and in order to succeed he must produce both quality and quantity. Let us cotton spinners consider the various points that have to do with the starting of the spinning frame and good running work, after the starting is over with.

First, we will examine the spindles, supposing them to be of the gravity variety. They should be taken out of the bolsters; the spindles, shells and bolsters thoroughly wiped to remove all particles of iron. After placing spindles, shells and bolsters in their proper places, the next thing is to put the bands on previous to setting the rings. Then the rings should be set with great care. We will suppose that the frame is correctly built. If so, the bolster rails, lifting rods and ring rails will be right in every way. If these things have received proper attention by the builder, the setting of the rings becomes a very easy matter. Not a simple matter though, for with a gravity spindle, excellent judgment, a good eye and much care is necessary in obtaining the proper adjustment. The bobbin or set used should be made to run perfectly true, being in balance so that when on the spindle there will be no vibration due to the set. The shape should be like the bobbin when filled with yarn. If there should be any more space between the ring and set at one point than at another, it should be slight and on the cylinder side, as the band has a tendency to pull the spindle towards the cylinder.

The rings are first adjusted in rails, or should be, with a set made cone shape, ground perfectly round, so as to show how much the rings are out of round. This should be done with the rail at the bottom of the traverse, by placing the ring so as to bring the screws to bear in such a manner that the rings may be brought into their proper shape, if out of round. No other than the three-screw adjustment can accomplish this except you use a rail in which the rings fit tightly. This seems to be impracticable, for the ring, all things considered, is the right thing to adjust. Next comes the thread guide, which should be set concentric with spindle. They should be made so the yarn can vibrate enough to throw the twist back towards the rolls and to avoid cutting the wire. The size of the wire should not be less than No. 8 by Stubb's gauge. They should be screwed in as tight as possible. An independent kink arrester is no doubt the best arrangement for catching the kinks. The long-tailed guides are very apt to be a little out of place; just enough so they do not always take care of the kinks.

Having spindles, rings and thread guides adjusted properly, the steel rolls should have attention. It *used* to be a custom with *old spinners* to use emery and oil, slushing the rolls, then taking pieces of card clothing and card or scour the rolls to remove any little imperfections that would catch the threads, winding them around steel rolls, and consequently spoiling the covers on top rolls. Sawdust was then used to remove the emery and oil, and whiting to polish them. All this might have been necessary twenty-five years ago. To-day none but spinners that have not kept up with the times would suggest any such nonsense. The steel rolls made long ago were harder than the steel rolls made to-day. The rolls ought to be sharp and smooth when they leave the shop. If we should use the emery and oil and card with such vengeance as they formerly did, it would be necessary to take the rolls out and have them stoned before starting. If there are any bad places in the rolls that catch the threads, a very fine fluting file and the finest emery cloth will remedy the evil. Thirty new frames recently started

had nothing used on the rolls but dry cop waste. They have been running some months, and as yet there has been no occasion to use even the fluting file or emery cloth. Having seen that the steel rolls are cared for, and the gearing properly set, the top rolls should have attention. Many different views are entertained as to the covering of rolls. What one considers practical, another may not. Some use the English skin, others the American. My experience has been with both. In one mill I use the English, in another the American. Both give satisfaction. The conditions are different. Weighting has much to do with the wear and tear of the rolls, and the running of the work. With good sharp steel rolls, a top roll covered with a good quality of American skin put on not too tight, on long boss rolls, weighted at about 32 pounds, will wear well and give good results.

Please note this statement on top rolls; it may be interesting: 13,100 gravity spindles, long boss rolls, speed of spindles 9,200 revolutions, No. 29 warp, average number of rolls used each year for eight years ending January 2, 1897, 2,850 — .217 rolls per spindle per year. Cost one $1\frac{52}{100}$ cents per spindle per year.

Mention has been made only of the more important points which are necessary to produce good running spinning. Now we will suppose the frames ready to start, the roving having been put in, and twist and draft adjusted. We are ready to start. Having started, it is necessary that all the wearing parts should have close attention until bearings are smooth and run clean. It now becomes necessary to have system and discipline. To obtain both in the fullest degree, the overseer should be an experienced spinner and a good disciplinarian, two qualities that do not always go together. Let us consider a system for ring spinning.

This we will do in a general way. The system to be adopted will depend largely upon arrangement of machinery and class of yarns to be manufactured, and purposes for which they are to be used. Help should be treated so as to gain their respect. Then it will be easier to teach them the correct way in which

to do their work. No arguments should be used between those in authority and those in their charge. Orders should be given in a business, and not in an overbearing and too authoritative manner. No manager should lose his self-control, for just at that point he will lose his control over those under his management. Overseers and second hands should be capable of teaching the help under their charge, correctly. If they show that they know their business, those under them will not attempt to take advantage of their ignorance. Under a good system, spinners should be taught and required to twist in piecing ends. When creeling, wind roving back on to full bobbin, instead of making waste; clean top rolls and steel rolls in a proper manner, being careful not to use more oil than is necessary. The roving creels should be kept clean, waste off the floor, and in boxes provided for that purpose. They should be taught to remain at their work and be watchful of the same, wiping off the roller beams and thread boards when necessary. No other cleaning should be exacted of a spinner if neat and tidy help is to be obtained. We all know it is difficult to secure such help as is desirable in a ring spinning room and keep them contented. They are continually wanting to go into the other departments. The difference in wages and obtaining neater work are the principal reasons. Work not cared for by the spinners should be and usually is done by help called cleaners. They are supposed to clean the spindles, bolster rails, ends of frames, roll weights, and do the sweeping; many times other work according to number of machines, etc. Cleaners usually oil the spindles. All gravity spindles should be oiled once a week, oiling a number of frames daily, putting in a small amount of oil. In this way the whipping of ends may be avoided in a degree. This whipping, or tendency of the ends to strike together, seems to be greater when the oiling of the spindle is less frequently done. Some responsible hand should give close attention to the cleaning and oiling of spindles; it pays.

The help for doffing the yarn from spindles should be carefully trained so that few ends will be broken, and machinery stopped

the least possible time. In small rooms the doffer may have some other work to do. The hand employed to put on roving should be taught to handle same with care, placing it in the centre of creels, moving what may be on creels to right and left. The spinners should use the roving from the ends, never taking any from any other place. In this way no roving is allowed to lie on the creels for days and weeks and become covered with lint and dirt. The oldest roving should always be used first. All imperfect roving, made so in carding department, should be returned daily and when the roving is looked over and returned to spinning room, it should be placed on one or more frames instead of being scattered over the room.

The roving hand may be required to do other duties, such as oiling shafting, putting on bands, etc., according to size of room. The spinner's waste should be attended to by the second hand, that is, he should inspect the spinner's waste before he orders it removed from the room.

It is very important that the spindle banding should be of the very best. A roving band is usually preferred, and no doubt is the best when properly made and applied. The statement below will give some idea of the number, weight, life, etc., of spindle banding, using 1,000 spindles as a basis.

In a certain room running the gravity spindle at 9,400 revolutions per minute on No. 29 warp with 6-inch traverse, 1¾-inch rings, 39-inch frame, 6¼-inch cylinder, during seven years ending Jan. 2, 1897, 1,153 bands were used per 1,000 spindles per year. Number bands per pound, 230; number pounds, 5. Tension when put on, 2½ pounds. Life of bands, 10 months, 16 days, nearly.

Care of banding: the cylinder should be brushed at least once in every ten days. This should be done carefully, taking care not to unduly strain the bands, the purpose being to keep the cylinders and bands clean and as free from oil and lint as possible; also to detect any bands that may have come to the point when they may cause soft yarn to be made. Whoever puts the bands on should follow up the brushing, removing such

bands as is necessary. This work should be under the supervision of the overseer or second-hand. Bands cared for in this way will always be in perfect condition and give no trouble during dog days.

Travelers are another important item, especially when high speed is being run. More travelers are wasted than are put on the rings. No doubt many spinners present can testify to the truth of this statement. It may not apply to all mills and probably does not. Many are thinking more seriously of the matter than before the size of rings and speed of spindles were so radically increased. I was recently informed that in a mill of 62,000 spindles on No. 28 warp and 36s filling, the bill for travelers for last November was $276. This is in a mill where very little changing is done, and the rings had been running from six months to a year. Speed of spindles 9,300 revolutions per minute. Remember that this excessive use of travelers is not due wholly to their quality. Travelers are made better to-day than twenty-five years ago. No doubt we get some poor travelers occasionally. Whether the combination helps the quality may be questionable. Travelers are being imported into this country and sold 20 per cent. lower than the American make. You will notice the tables which may interest you.

Table Number 1.

Mill No. 1.

New Rings.—No. 2 Flange.

						Average cost.
1889.	130 M.	6/o at 60 cts.	= $78.00	less 40%	= $46.80	= $7.67*
1890.	131 M.	" " " "	= 78.60	" "	= 47.16	= 7.73*
1891.	133 M.	" " " "	= 79.80	" "	= 47.88	= 7.85*
1892.	115 M.	" " " "	= 69.00	" "	= 41.40	= 6.79*
1893.	81 M.	" " " "	= 48.60	" "	= 29.16	= 4.78*
			$354.00		$212.40	$34.82†

*Per M. Spindles.

†Per M. for 5 years.

Hours run, 58; distance traveled, 13,702,133 feet, 2,595.10 miles.

Conditions: Rings, 1⅝-inch; traverse, 6-inch; revolutions spindles, 8,700; No. 29 warp, 6,069 spindles.

Ten weigh 6 grains. 6/0

The above were solid rings during 1889; then about half were changed during the next three years to double flange.

Table Number 2.

Mill No. 2.

New Rings.—No. 2 Flange.

1894. 260 M. 7/0 at 60 cts.=$156.00 less 30%=$109.20 for 7,040 spindles=$15.51 per M.

1895. 111 M. 7/0 at 60 cts.=$66.60 less 30%=$46.62 for 7,040 spindles=$6.62 per M.

1896. 64 M. 72/0 at 60 cts.=$38.40 less 40%=$23.04 for 6,400 spindles=$3.60 per M.

Conditions: Rings, 1¾-inch; traverse, 6-inch; revolutions spindles, 9,400; warp yarn, No. 30; distance covered by travelers, 16,016,424 feet, 3,028.87 miles; hours run, 58.

Ten weigh 7/0 5½ grains. 7½/0 5⅜ grains.

Table Number 3.

Mill No. 1.

New Rings.—No. 2 Flange.

1894. 260 M. 8/0 at 60 cts.=$156.00 less 30%=$109.20 for 6,096 spindles=$17.91 per M.

1895. 204 M. 7/0 at 60 cts.=$122.40 less 30%=$85.68 for 6,096 spindles=$14.05 per M.

1896. 118 M. 8/0 at 60 cts.=$70.80 less 40%=$42.48 for 6,096 spindles=$6.96 per M.

Conditions: Rings, 1¾-inch; traverse, 6-inch; revolutions spindles, 9,000; warp yarn, No. 29; distance covered by travelers, 14,174,620 feet, 2,684.58 miles; hours run, 58.

Ten weigh 6/0 6 grains. 7/0 5½ grains. 8/0 5¼ grains.

TABLE NUMBER 4.

Mill No. 2.

NEW RINGS.—NO. 2 FLANGE.

1896.	19 M. 9/0	at 75 cts.	=$14.25	less 40%	=	$8.55
"	237 M. 15/0	" " "	=177.75	" "	=	106.65
"	11 M. 16/0	" " "	= 8.15	" "	=	4.95
						$120.15

Time run, 10 months, commencing March 1st; number of spindles, 5,200; average cost per M., $23.10.

Hours run, 58; distance traveled, 14,926,068 feet, 2,826.9 miles.

Conditions: Rings, 1⅝-inch; traverse, 6-inch; revolutions spindles, 10,200; warp, No. 40; turns twist, 30. The 9/0 travelers were used in starting frames on No. 30 warp.

9/0	15/0	16/0
Ten weigh 5 grains.	3½ grains.	3¼ grains.

TABLE NUMBER 5.

Mill No. 2.

NEW RINGS.—NO. 2 FLANGE.

1896.	46 M. 17/0	at $ .75	=$34.50	less 40%	=	$20.70
"	88 M. 18/0	" 1.00	= 88.00	" "	=	52.80
"	12 M. 19/0	" 1.00	= 12.00	" "	=	7.20
"	16 M. 22/0	" 1.00	= 16.00	" "	=	9.60
						$90.30

Number of spindles, 1,472; average cost per M., $61.35.

Hours run, 58; distance traveled, 12,791,353 feet, 2,611.99 miles.

Conditions: Rings, 1⅜-inch; traverse, 6-inch; revolutions spindles, 11,200; warp, No. 42½ and No. 48s; turns twist, 23.

17/0	18/0	19/0	22/0
Ten weigh 3 grains.	2¾ grains.	2½ grains.	1¾ grains.

Geo. Draper & Sons' book for 1896 gives cost of travelers per 1,000 spindles: 1st year, $17.13; 2d year, $15.20; 3rd year, $9.71; 4th year, $8.38. Test made in a mill of 50,000 spindles, making Nos. 28s to 36s. No other particulars given.

A very good way to save travelers is to provide suitable cups and have them arranged so conveniently that the spinners will have no occasion to carry the travelers around in their mouths or pockets, or leave them loose on thread boards to be brushed off on to the floor. The cups should be made of such a shape that the travelers when placed in them may be easily separated and remain so; then the spinner can get a traveler without shaking up a bunch in order to obtain one. Travelers should be put into cups frequently and few at a time. This should be done by a careful hand, the overseer or second-hand if possible. If we set the example by taking due care and precaution, the help under our charge will form more careful habits and be more faithful in their duties.

Do we consider the question of bobbins for spinning as seriously as we should? Is it not too much a question of price when an order is given for bobbins? Should not the quality be the first consideration? Many bobbins are too heavy; a light bobbin is preferable for the reason that we do not wish to load the spindle more than is absolutely necessary. We want a large quantity of yarn and high speed of spindle. Does not the work required of the spindle have much to do with the speed it can be run with good results and durability? Are the average bobbins made to-day what they should be?

The subject of ring spinning as presented in this paper is very incomplete. Yet I hope, as the subject is extremely important to this Association, that some of the points treated of may be worthy of your consideration.

The PRESIDENT. Do any of the members wish to ask Mr. ADAMS any questions in reference to his paper or enter into any discussion? Other papers have been prepared upon this subject, one by Mr. EDWARD W. THOMAS, which he will now read to the Association.

SPINNING RINGS AND TRAVELERS.

EDWARD W. THOMAS, Lowell, Mass.

After the very able papers by Messrs. DRAPER and TINGLEY, who have given us some very valuable information, it may not be amiss to have a word or two from the manufacturer's standpoint.

I think one of the most important departments in a mill is the ring spinning room, one that needs the closest attention. I, however, find some mill men who think otherwise, that it does not require much brains to run a room. They purchase their frames, and take them as set up by the builders, and think then that the worst is over; engage as cheap an overseer as they can, forgetting all the while that good, strong yarn is only obtained by having their frames in perfect condition.

In a warp spinning department known to me are about 70,000 spindles, all new, or practically so. At the time these frames were set up and started we employed an inspector who examined every ring and spindle, and followed the setting-up gang. He rejected a good many rings and spindles, re-set and re-adjusted hundreds of spindles that were claimed to be right by the men setting up the machinery. All rings were tested by a gauge and those being out of round were rejected and returned to the makers. So much advantage was found to be gained by this inspection that we made the inspector a permanent fixture, and we find it pays. The course pursued by him is to thoroughly examine every spindle and ring of the whole 70,000. We look at rings as a question of supplies, the same as we do bobbins. As soon as a ring is found out of

round, or showing any indications of wear it is removed, and although we use the double flanged ring, we never allow the ring to be turned over and the other flange used, unless all the rings of any particular frame are worn, so that they can all be turned over. If the ring is removed on account of the wear, we save it until such time as we find a frame requiring new rings throughout; then we fit the frame up with the rings that have been rejected, having one of the flanges worn. We believe in the very closest inspection, and in having the inspector an expert in his line. We do not care to leave this matter to second-hands or section men, but to confine it to one man. In his inspection he thoroughly examines the traverse of the rails to see that in their rise and fall the spindle maintains its central position relative to the ring. We do this to reduce as much as possible the number of ends down, to save waste and piecings. That we get better yarn and better cloth is a well known fact, by this close and rigid inspection.

Too much care cannot be given to ring spinning, and it pays to watch it and care for it, as much as good carding requires careful grinding. Frames out of level, poor rings, and inattention to set of spindles cause more broken ends than poor roving in many cases. And, above all, don't accept from the maker any rings not round. They perhaps may tell you, as they do others, that it is impossible to temper a ring and have it keep its proper shape; but don't accept that, nor the rings either. That rings are better than years ago we admit, but there is room for improvement yet.

Relative to the matter of travelers, I do not think I can add any information to that already given, but will give a few figures that may be of interest.

Wilson Travelers.

On warp frames with 1⅞-inch ring, 6½-inch traverse:

12.50	yarn,	168	revolutions	front	rolls,	we	use	No.	4	traveller.
21	"	128	"	"	"	"	"	"	5	"
29	"	115	"	"	"	"	"	"	8	"

American Travelers.

On filling frames with 1½-inch ring, 7-inch traverse:

3.25	yarn,	232	revolutions	front	rolls,	we	use	No.	45	traveler.
3.75	"	198	"	"	"	"	"	"	28	"
4.75	"	220	"	"	"	"	"	"	20	"
5.50	"	200	"	"	"	"	"	"	26	"
6.25	"	200	"	"	"	"	"	"	14	"
7.50	"	190	"	"	"	"	"	"	11	"
9.50	"	190	"	"	"	"	"	"	11	"

Mr. C. D. ROBINSON. I do not know as anything new can be said about rings or ring travelers, but it is a fact that rings or travelers have got to be improved before we can run our ring spinning any faster. We have spindles that will run almost any speed, but the trouble comes — we cannot keep our travelers on. I do not think the different shapes of the flange would make any difference in the running of the traveler, and I have tried the different shape of travelers by longer and shorter horns, but have never found anything in that; the only thing that I found in the make of travelers was to make as small circle traveler as you could run on the ring, also not have them tempered too hard.

I think the trouble is with the ring more than the travelers, and we have got to improve the ring to have our travelers stay on or not wear out. I think the improvement has got to come by making the ring of a material that will take a smoother surface for the traveler to run on.

I once had charge of a spinning room where we put in 21,000 new rings; the first 14,000 rings ran very well. We could put on the travelers when the ring was new, and they would run seven or eight days with two or three travelers off. On the last 7,000 rings (from the same maker and the same traveler), the travelers would not stay on only about one day before they would run so badly that we had to put on a new traveler. We could not find any difference in the two lots of rings; in this case we found the wider wire travelers would run the best on the poor or rough rings, but on the first lot it did not make any difference which traveler we ran, wide or narrow wire travelers, and here is where the trouble is, the makers of rings do not know why it is that one lot of rings is good and another lot is bad, that is what they have got to find out and I think they will in time.

I took a lot of rings we had and sorted them out into two lots. One lot was as near round as I could find, and the other lot was those that were out of round. I put the two lots into a frame thinking that was the trouble of travelers flying off, but

it did not make any difference. I have not found any difference between 1¼-inch and 2-inch rings about the travelers coming off.

The PRESIDENT. Will any member carry this discussion further?

Mr. RUSSELL W. EATON. Mr. President, in regard to one point touched upon in reference to help. The restlessness that is manifested by the help in the spinning room at times after they get to about a certain age to get into the other departments, I find is not always a matter of wages. The girls, when they reach a certain size or age, seem to have a little pride in the matter of getting into the weaving room or carding room rather than to remain in the spinning room, the same pride, perhaps, that children have in the picking out of their playmates or of the school to go to. I would like to know what is the best way in which to regulate this matter. I will state for myself that we make promotions from the spinning room to the weaving room at a certain time in the year. We make them to a certain extent dependent upon the behavior and the excellence of the work of the operators in the spinning room. Promotion is for merit. Operatives, instead of asking and begging all through the year to get into the weaving room, know that promotion will not be made till a certain time in the year, say in December. Having been promoted, they come to have some proficiency in weaving by the time the green leaves coming out make certain weavers want to get out of the weaving room. A certain class of weavers, you know, want to get out of the weaving room in the spring. If there are other ways in which this matter has been handled, I would be extremely glad to know what they are.

The PRESIDENT. The general subject of ring spinning and spinning rooms is before the Association.

Mr. O. S. BROWN. Mr. President, we find a great deal more trouble with ring travelers than we do with the ring itself. Whether we are not paying enough for them or whether a ring traveler can be made better than they are today I do not know.

I had a call from a representative from one of your larger ring traveler establishments a year and a half ago. I brought that question up to him. He said that they were making as good travelers as they could make for the money, but said they could make better travelers if they were paid for it; and I asked him how small an order he would take, and I have forgotten how many thousand he told me he would try and make of the best ring travelers that could be made. I gave him the order. I think I was to pay him list price for it, and he was going to make them so that it would be a great improvement over any traveler that is made today. Up to date I have not received them. I have sometimes found a room going very badly, while in another room on the same kind of work, with all the conditions apparently similar, everything would be going very well. I would look over the room where there was trouble and find that they had bad travelers. These travelers, I understand, were made by the same parties that made those with which there was no trouble. I would have new travelers put in and they would run all right. We find more trouble with the traveler than we do with the ring.

Mr. HENRY T. WHITIN. Mr. President, I think Mr. BROWN has had the same experience we have had in travelers. We find that we get one lot of travelers and they run very well; we get another lot and they run badly. We get at the traveler man and kick like the mischief, and perhaps they run well again. I think we ought to insist upon having good ones. I do not think that the travelers today are as good as the travelers used to be before the ring traveler business all went into the combination. We certainly pay more money for them and I do not think we get as good results. Possibly this is because we are running a little faster. I think there is room for improvement in ring travelers as well as in rings. There is room for improvement in rings, as we all know, and I am confident that there is room for improvement in travelers.

The PRESIDENT. This seems to serve notice on the ring and ring traveler manufacturers, that they must improve their product.

Mr. A. B. MOLE. Mr. President, I agree with the last speaker as to the room for improvement in ring travelers. A short time ago I picked up a box of travelers we had had lying around for about eight or ten years, and put them on. I found they ran very much better than any travelers we get now. I do not know the reason, but I am sure they were better tempered travelers than those we are getting at the present time.

Mr. WILLIAM G. NICHOLS. Mr. President, I would like to ask Mr. ADAMS if he will tell us how he makes the band that he described here. It seems to me the Marshall band is very good indeed.

Mr. ALFRED E. ADAMS. I will say that we are now making our bands from a No. 8 hank roving using 8 strands, and we make what we call a core band using 8 threads of No. 30 yarn. Whether that has any advantage or not, I am not prepared to say, although I think it has. I make the band very soft, not hard-twisted. I am very particular not to get too much tension on the band. In our spinning room we have a testing scale that we test with, which is used frequently, and when bands are put on in the mills which I have charge of they are put on by the second-hands or section-hands, they being hands that ought to possess fair judgment.

Mr. LOUIS SIMPSON. I would like to ask what weight of cotton is used in that roving?

Mr. ALFRED E. ADAMS. The staple is about $1\frac{3}{16}$-inch middling to strict middling and good middling.

Mr. GEORGE P. GRANT, Jr. I would like to ask if these bands are marked before they are put on, or simply left to the judgment of the second-hand?

Mr. ALFRED E. ADAMS. I will say that the bands are marked and when we make them up we make up a year's supply, so as to get the hank roving as near alike as we can. This roving is twisted on a twisting machines before it is made up on the band machine, so that in each strand of roving we get the same tension, as near as possible.

Mr. O. S. BROWN. Do I understand, Mr. ADAMS, that you

twist your roving and your band together before you put it on the band machine?

Mr. ALFRED E. ADAMS. Yes, sir.

Mr. FREDERICK I. DANA. Mr. President, I would like to ask Mr. ADAMS how many turns of twists he puts in that roving before he makes the bands?

Mr. ALFRED E. ADAMS. Well, it is the ordinary roving. I don't know just what the twist is; I think about three revolutions.

Mr. FREDERICK I. DANA. Mr. President, I would like to ask Mr. ADAMS if he does not put more twists into the roving that he makes his band from than he does in ordinary roving from which he spins yarn?

Mr. ALFRED E. ADAMS. We do not; we use the same roving.

Mr. LOUIS SIMPSON. Mr. President, I would like to ask Mr. ADAMS what kind of knot he makes when he ties on the band to the spindle?

Mr. ALFRED E. ADAMS. It is what I call a loop knot; it is not a square knot. If I had a band I could show you; I don't know that I could describe it.

The PRESIDENT. We have as one of our topical questions the following:

Topical Question.

81. In what particular is the mule as built to-day, an improvement for spinning fine numbers over those of ten years ago?

Mr. JOHN TEMPEST MEATS. The mule as built today is, in many particulars, an improvement upon that of ten years ago; if it were not so, the greatly increased production now attained would not be possible. Besides the increased spindle speed which has been made possible by means of the flexible bolster

bearing, improvements have been made in the motions which go to ensure convenience, safety and certainty of operation, so that while much higher speed is attained in all the different operations, the spinner can successfully tend as large a number of spindles as ever. Speeds which ten or fifteen years ago were in vogue on what were then considered medium numbers, are now attained on numbers nearly twice as fine, as on 80s for example, 4½ draws per minute, 67-inches per draw, is now obtained with good preparation, giving a production of 30 hanks per spindle per week of 58 hours. Almost without exception the improvements which have been made during the past twenty years have consisted essentially of a more complete automaticity in the motions which were previously only partly automatic.

No new principle has been applied any more than on the ring frame during the same period, but the *amount* and the *cost* of production have been greatly improved by the increased speeds rendered possible, without diminishing the number of spindles which a spinner can mind.

The mule has been under such a constant state of improvement during the last ten years that almost every motion has been entirely remodelled, adding either to its range, strength, capacity or delicacy of operation.

After the spindle and bearing had been so improved as to permit of much higher spindle speed, came the demand for more positive and at the same time for more sensitive motions for winding the yarn, so that it might not be strained on the one hand nor kinky on the other.

Positive wind motions were therefore devised to work in connection with the locking of the faller, by means of which motions the wind chain is always taut and ready to start winding the instant the carriage moves towards the beam. Then when the winding motion is completed and the faller is unlocked free to rise, a faller check motion is brought into play which, being governed by the cylinder, gives the proper speed to the faller to guide the yarn to the top of the spindle without straining or kinking.

To ensure a proper relation between the carriage and the rolls at the time of commencing the spinning operation, an improved roll governor has been devised, by means of which the starting of the rolls may be hastened or retarded at will and a uniform tension upon the yarn obtained at this important point.

In addition to larger possibilities in spinning and winding and in the changes effected between those operations, the motions which may be called auxiliary to them have been much improved. For instance, the point or nosing motion is now made fully automatic and self-governing, and, being worked from the builder shoe, it will instantly correct any effort on the part of the spinner to slacken the yarn.

Improvements in the double stretch and jacking motions for very fine yarn have also been made so as to facilitate any desired variation in these motions at will.

Topical Question.

82. What is the best way to prevent double yarn on spinning frames where double boss rolls are used?

The PRESIDENT. Does any gentleman wish to answer this question?

Mr. STEPHEN A. KNIGHT. I wish, Mr. President, the gentleman who proposed that question would give us his views on the matter if he is present.

The PRESIDENT. If the gentleman is present who proposed this question we would like to have his experience. As there is no discussion, we will pass to the next topical question.

Topical Question.

83. What is the best covering for the top rolls used on frames and mules that are to spin various numbers?

The PRESIDENT. Mr. JOHN J. CONNELL has prepared a paper on this question and will now read it to the Association.

Mr. JOHN J. CONNELL. Mr. President and gentlemen of the New England Cotton Manufacturers' Association, since consenting to read a paper on the question, what is the best covering to be used on top rolls for spinning various numbers, I have been wondering where the improvements in top rolls were, or if there had been any in the last twenty years. About that time I began overseeing and one of the necessary qualifications was to be able to cover top rolls. Well, I thought that part easy, and went at it, but I soon found that a good looking roll would not always make good work and last. I used 26-ounce flannel and sheepskin, but I never could make a roll that would not hollow out and become worthless in a short time. I have run rolls covered with American lambskin, American sheepskin, and have experimented with different weights of cloth on solid rolls and shell rolls, and while I may not be correct in my idea of the best covering to use, I have obtained the best results from rolls covered with American lambskin, backed with good, even 14-ounce cloth. In my opinion, the lightest cloth that can be used would give the best results and last the longest, and if perfectly even leather could be obtained, it would run well on the roll without any cloth, but the unevenness of the leather must be overcome, as it is impossible to get it perfectly even, and even 14-ounce cloth is preferable to a heavier cloth for very fine spinning. I have heard of using English goatskin. This is very even and makes a first-class roll, but it is very expensive and consequently not very popular, but it is used by all mills spinning fine yarns for thread and very fine weaving yarns. I have heard of cuts being made of cloth tubing with a rubber coating on, but I understand they were a failure, also a thin wooden shell that was used in the same manner. I have never tried either of these; perhaps someone here can give us their experience with them. I would like very much to adopt the metallic rolls for spinning, but I have not found any who had courage enough to try it, yet I think the time will come when a metallic top roll of some kind will be used on all medium and coarse yarns. This question is of great importance and should

be agitated from time to time by this Association, until someone can be induced to make a discovery that will make a top roll that will be as substantial and lasting as the bottom rolls are, and gain a fortune and the everlasting gratitude of all spinners.

Mr. LOUIS SIMPSON. Mr. President, I would like to ask some questions on this topical question. The question was, "What is the best covering for the top rolls used on frames and mules that are to spin various numbers?" This question is put in a form that could be read in two ways. I thought at first that it meant to refer to machinery where the counts of yarn spun vary largely, but I find it was not so meant. I think that the paper read is rather apt to be misleading, and on behalf of the younger members of this Association, those young men who have not gone through the mill as some of us have, I would say that in my experience the roller cloth used by the reader of that paper is not satisfactory for most work. In the old country they use a very special roller cloth, and the lightest that I have ever heard of is 16-ounce. In my own mills, where we spin coarse yarns, we use 18-ounce, but it is a very good cloth; it is made especially and it is very hard pressed. I have had offered me in Canada, roller cloth made in this country which I would not touch with a pitchfork. It is not made rightly, in my opinion, and I can well understand that if you use poor roller cloth, the less of it used the better; I can well understand that. If you use none at all it will be far better, but I am sure that any of our friends here will agree, if they want to have good spinning, using a covered roller, they must have a good solid cloth made from good wool and very well pressed. As to the leather covering, I would say in my experience, spinning as I have done, both yarn spun from American as well as from Surat and also from Egyptian, that you have to adopt a covering according to the class of cotton you are using. You cannot use the same leather if you are spinning Surat cotton as if you are spinning American; and again, if you use Egyptian, you must again change your covering. I want to mention this because some of our friends might be misled and adopt this 14-ounce cloth and

one quality of leather for use on widely different qualities of cotton.

Topical Question.

84. Metallic Drawing Rolls: Have they come to stay, and how far can they be adopted?

Mr. DOW read the following paper:

METALLIC DRAWING ROLLS; HAVE THEY COME TO STAY AND HOW FAR CAN THEY BE ADOPTED?

C. E. W. Dow, Lowell, Mass.

The first question contained in the subject of this paper is one that I have been answering in the affirmative for several years past. This is no doubt the reason why the Board of Government chose me to answer it before the manufacturers collectively, as most of the members have heard my answer individually. I will try, however, in this paper, to go further into the reasons which cause such an answer.

The first reason for the adoption of any machine, attachment or process in a mill to-day, is economy. It is on this ground that the battle of anything new must be fought, and its staying powers tested.

I hold that anything that will reduce the cost of manufacture, without detriment to the quality of the goods produced, will ultimately obtain the recognition of manufacturers; or in other words, "will come to stay."

It is my purpose in this paper to show that the metallic drawing roll has reduced the cost without detriment to the product, has obtained the recognition of manufacturers, and "has come to stay."

The first considered and most apparent source of economy of this system is the total saving of covering and varnishing. Ever since I went to work as a boy on railway heads and drawing frames, I have heard of the desirability of some effective substitute for the expensive leather covering of top rolls. I will say that of late I find an evident disinclination of manufacturers to

admit the magnitude of this, especially when I was trying to sell the metallic system.

The exact amount of this saving is such a varying one that it is almost impossible to give figures on it. The kind of stock, weight of sliver, amount of draft and the personal equation of the man who determines when the rolls shall be changed, are all factors in this problem. In very few mills are the roll covering accounts kept separate, so that the exact amount chargeable to each separate process can be determined. In one mill I know the following figures to be correct: the roll covering bills for drawing rolls only for three months was $60.50 for 32 deliveries, which is an equivalent to 30½ per cent. annually on the investment necessary to install the system. In another case 10 railway heads require $2.50 worth of covering per week or a little more saving than in the previous case. Whatever this amount may be, it is all saved, at an annual cost of the interest and depreciation on the investment. That this gives a satisfactory balance in favor of the system, is evinced by the large number of repeat orders received from manufacturers.

Another saving is in power. While this is small it is nevertheless a factor too large to be neglected. It is a fact that the metallic drawing roll will actually deliver 33 per cent. more sliver to a revolution than the ordinary fluted roll with leather covered top roll. We, however, take a conservative position on this and guarantee only 25 per cent. more production at a given speed, diameter of rolls and weight of sliver being equal. It follows that to do an equal amount of work the speed of the rolls can be reduced at least 20 per cent.

This increase of production, over the ordinary system, has often been taken advantage of, especially in cases where in rearranging machinery not enough floor space is had for the drawing. In fact the first installation of the metallic system by the Metallic Drawing Roll Company came about by such circumstances. In rearranging a yarn mill from the American to English system of carding it was found necessary to have 120 deliveries drawing in three processes, or 40 deliveries in each

process. It was found that the width of the mill would only allow 32 deliveries placed crosswise of the mill. Any other arrangement of the drawing was out of the question without reducing the number of cards and consequently the capacity of the mill. We had at that time a trial order of 3 processes running in another mill belonging to the same company. We were called upon and supplied 96 deliveries of our rolls, guaranteeing them to do the work of 120 deliveries of the leather top roll system at same speed and same weight of slivers. This was done some five years ago. In proof that it was successful will state that we have since changed all the drawing in use by this company to our system. In another case it was found that 36 cards could be put in with an estimated capacity of 36,000 pounds per week of 58 hours. In this case there was room for but 25 deliveries to a process of 75 in all. Speed of 1⅜-inch front roll 400 revolutions per minute, sliver 65 grains. We guaranteed in this case a production of 37,000 pounds in 58 hours allowing 25 per cent. stoppage. This was very conservative figuring, as has been shown by a very material reduction of the roll speed since the installation.

The theoretical production of drawing rolls by this process, in convenient form for figuring, is as follows: 1⅜-inch front roll, 100 revolutions per minute, 100 grain sliver, 60 hours constant running, no allowance for stops, 821 pounds. To use this let us suppose a case, say 350 revolutions per minute of front roll, 65 grain sliver and 30 per cent stops. The formula takes this form:

$$\frac{350}{100} \times \frac{65}{100} \times .70 \times 821 = 3.5 \times .65 \times .7 \times 821 = 1{,}307 + \text{lbs.}$$

This can be relied upon as safe. It is seldom, if ever, necessary to use more than ⅔ of the weight on top rolls that is used in the ordinary system. Take an every-day case. A 6-delivery drawing frame on coarse counts; there would be graduated weights that would average 20 pounds each, 2 to each top roll or 48 to the frame, a total of 960 pounds. A removal of 320 pounds weight certainly means saving of power.

Roller laps are almost unknown with this system and there is considerable less fly and clearer waste, thus effecting a third saving, the total amount of waste chargeable to the drawing of a mill producing over 90,000 pounds of cloth per week averaging only 54 pounds. This system is very desirable when dyed stock is used. Certain dark colors, as blacks, browns and olives as well as bleached stock, usually give a great deal of trouble, especially in frosty weather. The friction of the leather covering generates electricity to such a degree as to cause great annoyance from licking up and sticking to everything the sliver comes in contact with. With the metallic system no such trouble ensues and the slivers run along nearly or quite as well as raw stock.

I will not take up more of your time in this direction, as most of the members have probably had their attention called to these points before, but will pass to the question of quality of the product.

The Metallic Drawing Roll Company does not to-day claim that the product from its system is any better than that from the ordinary system. It probably is not, when the latter is under its most favorable conditions; that is, top rolls in perfect condition, staple uniform, sliver light and evenly spread on the rolls. They do, however, claim to make equally good work under the best conditions of the leather top roll system, and better when the latter is not at its best. To cite an instance: the Massachusetts Mills in Georgia have the metallic system throughout drawing and slubbing. Their yarn, No. 13, breaks above 150 pounds always. DRAPER'S book gives breaking of 13s at 131½ pounds. Apparently quality has not suffered in that mill by the introduction of this system. It is frequently said to me by fine goods manufacturers, "No doubt the system is good on coarse numbers, but I should be afraid of it on my work." The next mill I go to may be on 6s and 10s. The agent says, "No doubt your rolls will work all right in fine mills where they have nice stock, long staple, combed perhaps, and everything nice, but I couldn't use it on my work, the staple is so uneven." The fact is, the system is working on most every number from 3s to 180s

in this country, and from waste and sweepings to 1¾-inch combed Sea Island.

Like every good thing, it has some peculiarities. It will not hide bad work, but from the crimping of the sliver as it comes from the front rolls, it allows every cut or uneven place to be seen, and patchy, cloudy slivers can be seen at a glance. The old system smoothes and condenses the sliver together, being dependent on pressure alone for drawing, and hides the imperfections. It is a fact that nearly always the sliver from the leather system looks better than that from the metallic system, but "Handsome is that handsome does," and the reel, scales and testing machines tell the story.

We are frequently told that slubber tenders prefer drawing made by metallic rolls where the two systems are running side by side. The reason for this is the fact that the drawing by this system possesses more tensile strength and does not break so often.

In one mill the drawing was dropped through the floor from a railway head, the turn table and can being on the floor below. Metallic rolls were put in and complaint was soon made that the drawing would not sustain its own weight. This lead to an investigation of spread and division of drafts. When these were put right it was found by trial that the drawing would sustain more of its length than that from the next railway equipped with the ordinary system.

It is very essential to the proper working of this system that the arrangement of drafts and the spread of rolls should be correct. Lack of attention to these two things have caused more trouble with the system than all other causes put together. Very few realize the amount of spread that can be given to rolls on heavy slivers in railway heads and drawing. Take a common case: card sliver 65 grains, 6 ends up, delivered at 65 grains on first drawing, staple 1⅛-inch. The drafts should be progressive from back to front, say 1.30, 1.71 and 2.47, total 5½ inches.

In giving these drafts, attention has been paid to a peculiarity of the metallic system. This is the fact that the draft by weight

of sliver exceeds the draft by figures, which is the reverse of the ordinary system. This amounts to about 9 per cent., that is, a frame drafted 5½ by figured gearing will give in the vicinity of 6 ounce weight of sliver, varying somewhat according to the weight of sliver and kind of stock used.

The back draft being slight is more for the purpose of straightening out the sliver than as a draft. Here almost any spread can be used provided it is not too close. It should never be in such a case less than $1\frac{9}{16}$ inches and can be a great deal more without detriment to the work. In the middle draft a sensible reduction of the bulk of the sliver is made. Here the spread should never be less than $1\frac{7}{16}$ inches for the conditions named and may be more sometimes. I have never found a case where the spread of the front pair should be less than $1\frac{5}{16}$ inches with the length of staple and weight of sliver named; that is $\frac{3}{16}$ inches over the length of staple. There are many cases where the spread can be even more. The tendency for the fibres to cling together is so constant that no cutting will ensue until these spreads are considerably increased.

This matter of proper division of drafts and spread of rolls deserves very careful attention. It is absolutely essential to even work and besides it requires very much less power to produce it. In the case of leather rolls, if they are too close with heavy slivers, they will slip and allow the work to go on, but with our system either the rolls must lift and allow the sliver to slip or pull it apart.

It is very essential, on frames that have a lifter roll, to see that there is no draft between it and the back drawing roll, and also between front roll and calender. Draft in either of these places is bound to cause uneven work.

In view of the fact that the total number of deliveries now in use in the United States and Canada, of all kinds, amounts to 37,480, the fact that comparatively few of them were applied without having first been thoroughly tested in the various mills, and that the business has been increasing for over six years, I think you will agree with me that the metallic drawing roll "has come to stay."

Having shown that the rolls have come to stay, the next thing to be considered is how far it is practical to use them. Personally I believe that they will ultimately be used on all drawing processes, including spinning. Up to to-day, however, the Metallic Drawing Roll Company does not apply them further than slubbing. This covers railways, drawing, combers, lap machines, lap doublers, ribbon lappers and slubbing. On all these machines the rolls have proved highly satisfactory. As fine as 90s yarn has been spun experimentally in the shop from roving prepared entirely by the metallic system. This of course does not prove that it would be successful on a large scale in the mill, but it is on this that I base my opinion as to the ultimate use of the rolls. Any mill desiring to make coarse yarns, say 6s or coarser, can have the metallic system throughout. The Metallic Drawing Roll Company are prepared to take orders for such an equipment under guarantee as to the success of the system. In detail this would mean two processes of drawing, one roving (slubber) and the spinning frame. I have here some samples of yarn made in the shop from such a system. No. 2.98 from waste stock only, breaking at 415 pounds; standard for 3s being 530 pounds. No. 5.15 also from waste, break 233 pounds against standard 5s, 330 pounds. On clean short staple stock I have 3.10s breaking at 570 pounds against standard 530 pounds for 3s, and 6.12s with average break 303 as against standard 275 pounds for 6s.

Of course you will know that at the mill where this system originated the system is used to a greater extent than I have mentioned as practical to-day. I have often quoted the results from that mill, but have always encountered a feeling that the system was being "petted" there. So I will leave them out of the question, as they are amply able to take care of themselves. The metallic system has not as yet got into extensive use in slubbing, but in every mill in which it is installed it has given entire satisfaction, and I doubt very much if the people who have it could be persuaded to dispense with it.

In trying to extend the use of the metallic system to slubbing,

we encounter very much the same feeling that we previously did on railway and drawing rolls, and find manufacturers very skeptical in regard to its value. We have it, however, installed in three mills in slubbing to the exclusion of the ordinary rolls. It has been thoroughly tested in them and in two of them it has been applied to new frames when the plants were increased, which proves conclusively its success on their work. The third mill has made a dividend on its first six months' run, so we don't feel uneasy as to the roll question there.

The main difficulty in applying metallic rolls to slubbers now in use, lies in the fact that it is necessary to have double the number of roll stands less one, and of such a form as to do away with cap bars. This requires such an outlay as to make the price prohibitive. On new frames this does not apply, therefore we have to depend on new work for the introduction of the rolls.

The Metallic Drawing Roll Company guarantees satisfactory working of all rolls sold. It is on this line alone that we have achieved our success with the system. They are glad to co-operate with any manufacturers who wish to experiment on the extension of this system and will take up, in our experimental department, any experiment that seems to be of mutual advantage to the manufacturer and ourselves, at no expense to the former, until the results are in satisfactory working in the mill.

I subjoin a table showing approximately the number of deliveries applied to the various makes of machines in this country, but which I will not take up your time by reading.

Atherton Machinery. — 1,946 deliveries drawing, 45 railway heads.
Brooks & Doxey Machinery. — 15 deliveries drawing.
Curtis Machinery. — 14 lap machines, 1 comber draw box.
Fall River Machinery. — 216 railway heads.
Franklin Machinery. — 107 deliveries drawing, 60 railway heads.
Hetherington Machinery. — 1,917 deliveries drawing, 174 lap machines, 1 ribbon lap, 305 combers.
Higgins Machinery. — 42 deliveries drawing.
Howard & Bullough Machinery. — 3,617 deliveries drawing.
Dobson & Barlow Machinery. — 691 deliveries drawing, 9 lap machines, 1 ribbon lap, 972 slubber spindles.

Lowell Machinery. — 3,098 deliveries drawing, 524 railway heads.

Mason Machinery, Taunton. — 408 deliveries drawing, 48 railway heads.

Mason Machinery, England. — 195 deliveries drawing.

Patterson Machinery. — 12 deliveries drawing.

Pettee Machinery. — 6,306 deliveries drawing, 522 railway heads.

Platt Machinery. — 107 deliveries drawing.

Providence Machinery. — 1,704 slubber spindles, 3,840 intermediate spindles, 7,632 jack spindles.

Saco Machinery. — 275 deliveries drawing, 287 railway heads.

Whitin Machinery. — 1,772 deliveries drawing, 384 railway heads.

Woonsocket Machinery. — 456 slubber spindles.

The PRESIDENT. Do you wish to ask the gentleman any questions or enter into any discussion?

Mr. GEORGE P. GRANT, Jr. Mr. President, I would like to ask Mr. DOW how he accounts for the excess of draft with the metallic system? He says, "A frame drafted 5½ by figured gearing will give in the vicinity of 6."

Mr. C. E. W. DOW. There seem to be various theories in regard to that, but my opinion is that the fact of one flute pressing the sliver between the other teeth on flutes induces a draft. That is to say, running a sliver through one pair only of rolls would cause a draft.

Mr. GEORGE P. GRANT, Jr. Were these tests made from the back of the machine to the calendar or from the back to the rolls? Is not there a draft usually between the front rolls and the calendar roll — more of a draft than with the old system?

Mr. C. E. W. DOW. No, sir, we do not intend to run any draft in that place. Practically there is a small draft, perhaps about 3 per cent., enough to keep the sliver from sagging by its own weight.

Mr. JOSEPH M. DUNHAM. Mr. President, before the metallic roll is dropped I would like to make a few remarks on the subject myself. I have no paper to read on the subject, but probably I have had more experience with the roll than any other man. And I would like to say that I can give you the reason why I think the metallic roll has come to stay. It is because in Holyoke, where it was invented and put to work all the way through, clear to the spindle, we make from 6-hank roving to 24, we spin from No. 20s to 132s out of roving that is made from the metallic roll, and we do not ask any odds of anybody that is making roving anywhere in this country or in any other country about the question of the roving that we make. If you wish to know about that, we made some roving a year or more ago to go to the other country, some 24-hank roving. That was sent to England and one of the finest spinners in England looked the hank over and said if that was made on the metallic roll he should be willing to adopt it. He took the roving to his

works and spun it, and on the strength of it has put metallic rolls in the mill. How far they have come to stay, and how far they are going to go is only a question of experience and testing. We make 24-hank roving; it can be made into 34 yarn. Now we tested this on the spinning frame and we spun 40 yarns without any trouble. We only just made a little temporary experiment; it was not properly made at all, just put it in to try it, and we spun 40 yarn. Now there is no question in my mind, it is only a question of the making of the rolls, the proper flutes, and the number of flutes to the inch, when I think there is no doubt we can spin up to No. 40 just as well as we can make No. 1 hank roving. I know what I am talking about. As to the expense and the saving, we have the very first drawing head running now that was used twelve years ago. We do occasionally remove the roll, clean it and put it back in its place. We never can wear the rolls out because those we use run lower and use lighter weights. And another reason why the metallic system will beat the other system is this: we do not claim we can make any handsomer drawings with the metallic roll than we can with the ordinary roll when it is in proper condition; but I want to ask the gentleman here how long his roll is in proper condition? The eye is not able to detect when it is going to depreciate and go to pieces; it has to get in pretty bad shape before a man sees that he is not making the right sliver from a leather covered roll. Now when we first started that roll and put it in we were surprised to see it run down on the table, it delivered so much more than the other would; it came right down on the table. We had to drive the calendar roll faster before we could gather it up. We gathered up about 33 per cent. — that roll was actually delivering 33 per cent. more than a leather roll. And it was as Mr. DOW says, undoubtedly 20 to 25 per cent. more production than with the ordinary leather covered rolls.

Mr. LOUIS SIMPSON. I would like to ask the gentleman, Mr. President, if the 24 roving that was sent to England was put through every process using metallic roll?

Mr. JOSEPH M. DUNHAM. Yes, sir. The roving was made on the metallic rolls all the way through to the spinning. There is another thing about it which I might add. You have not got to go through the mill to see if your drawing is right or not — we know it is right. If those rolls are taken out and cleaned and put back in their places, that is the end of it till they are taken out and cleaned again. It makes no difference what the weather is, whether it is sticky or dry or anything else, it runs right along properly in dampness or any other conditions. The roller will not take up any of the stock unless you get some sticky substance upon it, then it will only take up what the "stick" will hold. Sometimes it will run around; if it does it runs around so loose that you can pull it off. The roving was made at the Merick Thread Company's mill, was sent to England and was spun by WM. HEATON, Lostock Junction, Bolton.

Mr. STEPHEN A. KNIGHT. Mr. President, in Mr. DOW'S remarks he told us that where it required of the leather covering forty deliveries, they supplied the place with 32 and got the required amount of sliver. I want to inquire of Mr. DOW, what was the occasion — for what reason did the 32 deliveries deliver as much sliver as the 40 would with a leather covering? Was it from the fact that the machine ran better and made less waste, or was it from an increased speed, or was it from an increased draft consequent on the two fluted rolls running together, when it gave a longer sliver and consequently ran a heavier back sliver?

Mr. C. E. W. DOW. As Mr. KNIGHT'S question calls for the reason, I would state that the sliver ran faster. We guarantee the same production at the same speed of rolls — that is, the same number of revolutions per minute; so the increased production is due to the fact that the metallic roll delivers more to the minute than a leather covered roll of equal diameter. There is a gain, however, in the better running and the reduced number of stoppages with metallic rolls. It has always been claimed as a factor in that guarantee.

Mr. STEPHEN A. KNIGHT. Then the fact was that the back sliver was heavier than in the case of the leather covered roll?

Mr. C. E. W. DOW. Not at all, sir. It simply travelled faster. It was taken in faster and delivered faster at the same number of revolutions.

Mr. JOSEPH M. DUNHAM. You have to take out draft to bring up the weight.

Mr. C. E. W. DOW. The introduction of metallic rolls into any frame is equivalent in effect to the speeding up of the frame from 25 to 33 per cent.

Mr. STEPHEN A. KNIGHT. I understand that, but I wanted to know for what reason?

Mr. C. E. W. DOW. Why does a metallic roll deliver more than an ordinary roll?

Mr. STEPHEN A. KNIGHT. Yes.

Mr. C. E. W. DOW. Simply because the sliver follows the convolutions of the flutes in and out, and gives a greater length than the periphery of the points of the teeth.

Mr. JOSEPH M. DUNHAM. And positively no slipping, where there is a slipping all the time with the other form of rolls.

Mr. STEPHEN A. KNIGHT. Then in coming a greater length it is finer?

Mr. C. E. W. DOW. It would be if it was not provided for in reducing the draft.

Mr. STEPHEN A. KNIGHT. That is what I wanted to get at. If you reduce the draft and run the back roll at the same speed as you would the covered roll, how is it that you would get more weight of cotton through the machinery?

Mr. C. E. W. DOW. The reduction of the draft simply amounts to about 9 per cent. That is, as I stated before, 5½ figured draft will, under ordinary conditions, give you 6 by weight.

Mr. STEPHEN A. KNIGHT. I presume I am a little stupid, but what I can't understand is, if you run the same speed of the back roll, how you get more weight of stock through unless there is a heavier sliver or a larger back roll. If you do not take up more cotton I do not see how you can deliver more cotton.

Mr. C. E. W. DOW. The back roll running the same speed will take up from 20 to 33 per cent. more than the ordinary roll, simply because the amount of stock taken up by the back roll is not measured by the periphery but by the outline of the teeth.

Mr. STEPHEN A. KNIGHT. Well, I fail to see just how you can deliver more cotton than you take in.

Mr. LOUIS SIMPSON. Mr. President, I think I can explain to Mr. KNIGHT.

Mr. STEPHEN A. KNIGHT. Then I will sit down. It is immaterial to me who explains, so that we get at the facts.

Mr. LOUIS SIMPSON. Although I have not got these rolls in, we long ago used similar rolls in the old country in the back roll of drawing frames, known as corrugated back rolls. We found that the coarse flutes gave us a different circumference of roller and so had to alter our apparent drafts. Now, for instance, you take up the inch roll of the ordinary old-fashioned flute, and the circumference would be about 3⅓, whereas with the corrugated flutes the 1-inch roller would pass nearly 4 inches of cotton. It is evident that if the rows of rollers are made with the same kind of coarse flute, it is equal to putting into your machine rollers of a larger diameter, and as they are going at the same speed as the smaller rollers were, of course they will put more through the machine. Does Mr. KNIGHT understand now? [Laughter.]

Mr. STEPHEN A. KNIGHT. I think I do, sir. What you mean to say, sir, is, that it is equivalent to putting in a larger roll?

Mr. LOUIS SIMPSON. Certainly.

Mr. STEPHEN A. KNIGHT. And consequently taking up more sliver?

Mr. LOUIS SIMPSON. Certainly.

Mr. STEPHEN A. KNIGHT. But I asked Mr. DOW to answer whether it actually took up the sliver faster from the back side of the fluted roll than on the covered roll, and I understood Mr. DOW to say it did not; and consequently I did not see how,

taking up less cotton, he could get the same amount of yarn. [Laughter.] If such be the fact we want to adopt these rolls in all of our mills at once.

Mr. JOHN J. CONNELL. I would like to ask the gentleman who spoke about the wearing of the leather rolls, what kind of saddles he uses and how much weight he uses on them in order to prevent the wearing on the necks?

Mr. JOSEPH M. DUNHAM. We use much less weight, not more than a third the weight. On our 7-inch frames the weight is taken off entirely. We make the rolls of the same length instead of putting in short rolls. The top rolls are the same length as the bottom ones, running from stand to stand, and we just use weight of the roll; that is all there is to it. We have no weights at all. We keep them well oiled. If you never abuse them you will never have cut roving. It runs just the same every day in the week and every day in the year, the same kind of work. You have not got to look around and see whether the roving is cutting or anything of the kind. I have them running in three mills and never think of such a thing as looking to see if the drawing is cutting. You can go and look and they are always running just alike, every day in the year. That you cannot do where you use the leather covered rolls.

Mr. JOHN J. CONNELL. I have quite a number of them running, and while we were in our infancy with them I have found on one drawing frame of four deliveries, a ten pound weight running on the front roll, five pound weight running on the next roll to it, and the next roll running without any weight at all, and all the slivers just barely finding their way to the trumpet. I went at the overseer to know what was the reason of his running it that way, and he told me he could not run them any other way, and invited me to try and find out if I could and teach him how. I tried and—I don't know that I could explain the result; I am not saying that in any way disparaging against the steel roll, I am only speaking of it to get information on some things from someone else. That was my experience with them and I have actually seen them running under those

conditions. And now I have got them all running under equal weights, but there are times up to the present time that I go in and find some running without any weight at all, and some with a very small weight of one pound or two pounds hung on one roll and the rest of them the ordinary five pound weight, and I inquire the cause of it and they tell me, "Well, we couldn't make it run any other way." And I find that up to the present time whenever I find them, I try to get out of it and get the weights all equal and keep them so. Another thing about their never wearing with a five or six pound weight on them: I have found some of the necks wearing some, and that was why I asked the question in regard to what kind of saddle was used on them. It would be absolutely necessary to use some kind of weight on a drawing sliver from 500 to 600 grains, double from 6 to 8, with four or five kinds of sliver. You could never run them without some kind of weight. And I asked the question of Mr. DUNHAM, what kind of saddle, to get the information on that point as to how the necks are wearing.

Mr. JOSEPH M. DUNHAM. We use the hard wood saddle. We do not think of running them without any weights on the back side. If the frames are properly adjusted and the rolls properly set, there is no more trouble in running the metallic roll than there is with the leather. The only difference is, the leather rolls are always slipping more or less. Metallic rolls do not slip. And if you have not got them properly set, no live man can tell you how to set them, you have got to learn yourself. The heavier your sliver the more open you must have them. That is something nobody can teach anybody; they have got to learn it by their own experience. And when you get them once right, you need never worry about changing them for running that same kind of stock and the same weight. But when you begin to monkey around and get something a little heavier, then you have got to go at your rolls, just the same as you have with leather rolls. Give them just the same chance you do your leather rolls and use the same common sense with a metallic roll you use in running leather rolls, and you will never want a

leather roll after you have once used the metallic. If there is any gentleman here that wants to satisfy himself on that, I will give him an invitation to come to Holyoke before he goes and I will show him our mill running, and if you ever see one running much better, let me know.

Mr. JOHN J. CONNELL. Mr. President, I perfectly agree with Mr. DUNHAM in that, and I am not anxious to get rid of the metallic roll; I would not exchange it today for the old leather roll. But I am to understand from his statement that it is all wooden saddles that are used on them instead of iron — there are no iron saddles in use at all on the metallic roll?

Mr. JOSEPH M. DUNHAM. Oh, yes, they do use them; they use hooks; but it is better if you use hooks to put hard wood inside. Perhaps cast iron would run on them just as well.

Mr. ABEL T. ATHERTON. Mr. President, I thought that this metallic roll question, being in one of those topical questions, would meet the same fate as most of them — nobody would speak on it at all. This is an exception to that rule, and I thought in order to help the Association out on that subject that I would say something, but it will only be a repetition of what has been said. I may advance something a little different from the rest of them.

In answer to the topical question "Have metallic drawing rolls come to stay?" I would unhesitatingly say, after an experience of over three years in the matter of manufacturing and introducing the metallic drawing rolls, that they of necessity have come to stay.

Probably most of the members of this Association are familiar with the various arguments heretofore made in favor of the metallic drawing rolls, but there are some great advantages that have not been touched upon heretofore by advocates of the metallic drawing rolls, prominent among which is the fact that they are automatic eveners, as I will explain. When a sliver of cotton is passing between a covered top roll and a bottom metallic roll, the top side of the sliver which comes in contact with the covered roll is not drawn so much as the under side of

the sliver which comes in contact with the metallic roll, and if the sliver is moderately heavy the centre of the same is drawn differently from either.

Now, it can be readily perceived that with such a condition of drawing you may have just as even work from the pickers to the drawing as is possible, and it is all of no effect after the sliver has passed through the drawing frame and this bad condition of affairs continues and increases as the sliver passes forward to the spinning frame at which point it is more uneven than at any point previous in its manipulation.

It cannot be otherwise where covered top rolls are used as the drawing process of the sliver is dependent wholly upon the friction of the same upon the smooth top rolls, and in connection with and support of this theory I will state the result of an experiment made by one of our most successful agents.

He was greatly prejudiced against the metallic drawing rolls from what he had been taught earlier in life, and it was only upon my earnest solicitation that he would allow me to put a set of metallic drawing rolls into one of his railway heads, and I can best state the result by using his own words, which were, that he tried them upon his sliver coming from his cards, and followed the product through to his yarn, and he stated that he was thunderstruck at the difference in the quality of the yarn between that which had passed through the railway heads containing covered top rolls and bottom metallic rolls, and that which had passed through the railway head containing all metallic drawing rolls. He stated that the yarn was rounder, more even, and stronger in the latter case than in the former, and he also stated that he noticed that the belt on the cones of the railway head containing the metallic rolls, travelled but very little, while it was continually travelling back and forth over a considerable part of the cones on the railway heads containing the leather covered top rolls and the metallic under rolls.

My theory for such a result is this: the sliver, passing between the covered top and metallic bottom rolls, owing to the slipping of the same, would so effect the evener that when an

amount of short and long staple was passing through, the cone belt would be forced to one end of the cones to accommodate such a condition of affairs, and almost immediately afterwards the opposite condition of affairs would result.

With the metallic drawing rolls in use it did not matter what the condition of the sliver was, as regard long and short staple, the metallic drawing rolls held it all alike and drew it so evenly that the belt in the cones scarcely moved over their surfaces, and the superior yarn produced at the spinning frame was the result of the superior work produced upon the railway head containing all metallic drawing rolls.

I would also state that this mill agent was so well pleased with the results produced by the metallic drawing rolls in one railway head, that he immediately ordered metallic drawing rolls for the remainder of his railway heads, and I have no reason to think that he is otherwise than pleased with the results of their work.

My theory of the automatic evening produced is as follows: when a heavy amount of sliver is passing between the metallic drawing rolls, the ribs of one roll do not press so deeply into the flutes of the other roll, consequently do not take up so much in length of the sliver as when a light amount of the same is passing between the rolls, consequently no matter what the weight of the sliver is before passing through the rolls, a comparatively even weight is produced.

My opinion as to the latter part of the topical question is that I can see no reason why the metallic drawing rolls cannot be carried through to and including the spinning frames, and I am confident such will shortly be the case.

Nearly all if not every manufacturer present well knows that the old style of belt driving for the rolls on a spinning frame has been discarded on account of the settled conviction that such a method of drawing is not positive enough to ensure good work on the frame, and it is strange to me that top covered rolls should be continued in use when the chances of uneven and non-positive drawing of the sliver are infinitely greater than by the use of the metallic drawing rolls.

There is another and great advantage to be gained by the use of the metallic drawing roll over that of the covered rolls, which is this: from the first moment the covered rolls are put to use they deteriorate in the results obtained, and this continues and increases up to the time of their re-covering, for it is impossible that any other result should be arrived at, as the pressure of the sliver, induced by the bottom fluted rolls upon the covered rolls, softens and stretches the leather covering, making it simply impossible to draw the cotton any two days alike again; no one ever saw two pieces of leather of exactly the same density, consequently no matter what care is exercised in the selection of the covering leather, there will be a difference in the draft on the covered rolls occasioned by the greater or less draft produced upon the same when the sliver pressed by the bottom rolls is against them.

Again, the condition of covered rolls is affected by continual changes in the temperature, the leather covering being particularly sensitive to such changes, and the result of this is that the operatives are continually obliged to change the draft gears to accommodate such atmospheric changes.

By the use of metallic drawing rolls all of this care and precaution is unnecessary, for they are not affected by any atmospheric changes as regards themselves, but are as positive in their draft and durable in their wear after long use as when they were first started up. A friend of mine, some years ago, being desirous of determining the matter of the different conditions of evenness of the sliver from the picker to the spinning frame, made a series of exhaustive experiments and proved conclusively that the sliver was the more even immediately after leaving the picker than at any other of the following stages in its manipulation, and the only true theory in my mind for such a result is that it is in consequence of the uneven draft produced upon the sliver by the covered rolls used in the different machines from the picker to the spinning frame.

Another advantage of the metallic drawing rolls over that of covered rolls is the item of expense of covering, which in the

case of the covered rolls is something considerable, and in that of the metallic drawing rolls is nothing.

Mr. JAMES BUTTERWORTH. Mr. President, Philadelphia is said to be a slow place, and I may emphasize the truthfulness of this when I say that my remarks are to be made upon the first paper read this morning. Mr. BROOKS read a very valuable and interesting paper here, and I was astounded to hear of the advance that has been made in that textile school. He, however, referred to schools in Europe and specially mentioned schools in England, but never once referred to the Philadelphia Textile School. Now if, as has been proposed, you intend to have your fall meeting in Philadelphia, the Philadelphia contingent will be pleased to take you to the first textile school in America. [Applause.]

The PRESIDENT. I think that the Association has not forgotten the kindnesses of the Philadelphia School. Mr. BROOKS, in his paper, made a complimentary reference to Mr. FRANCE who was before our Association last year, and we are very glad to have it brought to our attention at this time.

The hour has arrived when it would seem wise to adjourn, and if there is no objection this meeting is adjourned until two o'clock.

FOURTH SESSION.

THURSDAY, APRIL 29, 1897, 2 P. M.

President LOWE in the chair.

The PRESIDENT. As Mr. SHELDON is not present I will ask the Secretary to read his paper.

ELECTRICITY FOR MILL PURPOSES.

FRANK P. SHELDON, Providence, R. I.

It is impossible to lay down any rule by which the advisability of using electrical transmission of power may be determined for all cases. Every case must be carefully studied individually and decided upon its own conditions.

It is to be kept in mind that electrical apparatus does not produce power, but converts and transmits power, and (in the case of the storage battery) accumulates power which has first been produced by engines or water wheels or chemical action. Electrical apparatus to-day is at such a state of perfection that it is hardly any question now as to what *can* be done but what is *advisable* to do with it. And the question of advisability is always necessarily one of conditions in each case.

The elements entering into this decision may be many. In cases of large amounts of power the question is of economy of operation. In other cases it may be one of convenience, or feasibility, ignoring the cost to greater or less extent.

In the first instance, of large amounts of power transmitted electrically to cotton mills, the standard of comparison is with modern steam plants, which in New England produce a horse power for about $15 per year of 310 days of 10 hours each, this cost including fuel, oil, waste, labor, taxes, interest at 5 per cent. and depreciation 5 per cent., with fuel at $3 per ton. If fuel is at $4 per ton this cost will be increased to about $17 per year. Where cheap fuels can be used the cost will be less than the above.

Heating is not included, as this must be done in either case, whether the power is water or steam.

Actual cost per horse power per year of running a steam plant of 1,160 horse power compound condensing engines, steam at 125 pounds; coal, mixed dust and slack, costing $1.76 per gross ton in boiler house; power indicated twice every day in the year; taken from the actual yearly accounts in a cotton mill, not from any tests or estimates:

Fuel,	$4.76
Labor,	2.34
Repairs,	.19
Supplies,	.31
*Fixed charges,	4.04
	$11.64

In comparison with the above, the installation of water power with electrical transmission would not be justifiable on account of high initial cost and losses in conversion and transmission.

If a mill desires to install a lighting plant and has surplus water to furnish power for it, it will sometimes pay to do this, using the same apparatus to transmit power to motors in the mill, when the lights are not in use. The charge against *the power* then consists in the motors only, and may be advisable and advantageous.

The most economical way to light a mill, which uses either water or steam as initial power, is the combination of a generator

*Taxes, insurance, interest at 5 per cent., depreciation at 5 per cent., on cost of entire apparatus.

and storage battery, the generator being connected to the mill shafting at some convenient point.

The installation of electrical generators and storage batteries to accumulate power from surplus water outside of mill hours, will not pay, generally speaking, owing to large initial cost. There may be peculiar conditions, however, in some cases, which might make it advisable.

There are many uses to which electricity may be put, in small amounts, about a cotton mill, which make it the best, and in many cases the *only* feasible agent to fulfill the conditions satisfactorily. In print works especially, it may be applied to drive printing machines.

It may be used to carry small amounts of power to different parts of the yard for various purposes, where the other means of power are not feasible or as economical. It may be used to drive boiler feed pumps, when they are located distant from the mill shafting (as I have done in a large electric street railway plant). It may drive elevators in storehouses. Storage batteries of small size may be used to operate fire and burglar alarms and watchmen's registers outside of mill hours.

In general, it may be said that electrical transmission of power for cotton mills is feasible where convenience, feasibility, intermittent use, unusual hours, etc., are to be considered, rather than economy of power. But these uses apply equally to other industrial establishments, and are not peculiar to cotton mills.

In the installation of a lighting plant for a cotton mill it is well to consider the possibility of using the electrical apparatus for small motors for various purposes, and they can be applied with moderate cost at any time.

It is sometimes advisable to install one central electric lighting plant for a group of mills—where the conditions justify it—as I have done in two cases with good results, utilizing water which was otherwise wasted, for lights and power, from the same generators and line.

Finally, while electricity is available as a useful agent for carrying power, the advisability of using it must be determined in every case by a careful study of the pros and cons.

Mr. LOUIS SIMPSON. Mr. President, I am very sorry that Mr. SHELDON is not present so that he might answer the objections which I have to make to his paper. I have myself during the last year installed an electric light plant, which was in operation in a very short time, with a capacity of 1,000 horse power through two motors, and it is arranged so that it can be increased as required to 2,000 horse power. I am able to generate power at less than the prices stated here as being the cost for the most modern steam plants. If I can do that, I can say, therefore, that Mr. SHELDON'S conclusions are incorrect. The only good clause in the paper which I have found, is the last one: "Finally, while electricity is available as a useful agent for carrying power, the advisability of using it must be determined in every case by a careful study of the pros and cons." That, I consider, is the most useful sentence in the whole paper.

The PRESIDENT. I regret that Mr. SHELDON is not present. Some other members spoke to me in reference to this subject and wished to hear the paper and have some discussion with reference to it.

Mr. FRANK M. MESSENGER. Mr. President, I notice Mr. F. B. H. PAINE, the New England representative of the Westinghouse Company, is in the hall. I do not know that he is a member of the Association. If it be in order I will ask that he be invited to speak to us in regard to this subject of electricity.

The PRESIDENT. If there is no objection on the part of any member we will listen to Mr. PAINE.

Mr. LOUIS SIMPSON. I would like to add, Mr. President, that I would be very glad to show any member of the Association our plant at any time. Some of them may be going up to Canada during the next hot spell, and if they will drop me a note a day or two beforehand so that I will be there, I will be very glad to show it to you and explain the cost and anything that I can.

The PRESIDENT. Did I understand Mr. MESSENGER to say that Mr. PAINE was present?

Mr. FRANK M. MESSENGER. He is present; I did not know

whether he was a member or not. If he was not a member I thought I would like to invite him to speak; if he is a member he needs no invitation.

The PRESIDENT. We would like to hear from Mr. PAINE if he is willing to contribute to the discussion.

Mr. F. B. H. PAINE. *(By invitation of the meeting.)* I listo Mr. SHELDON'S paper with a great deal of interest, and particularly the part wherein he refers to the use of central stations supplying power to one or more mills separated somewhat, and which in the past have generally been lighted by separate installations. There has been a feeling I think, in the past, that the small amount of power used by the dynamos in each mill to supply the light required did not amount to anything and therefore could be neglected, and you could put a dynamo on anywhere and not mind it. Where there are conveniences, as in Grosvenordale and at Lonsdale, for the establishment of a central station supplying the light and power to the several mills in the vicinity, the advantages by that method of transmission are just as great as they are in the central stations of a great city over the supplying of power by local isolated plants. The attendance is very much less, the cost is reduced to a minimum, is kept to a minimum because it is known what the cost is, and it also enables the use of small amounts of power in isolated places which when operated from mill shafting, requires the whole to be kept in operation simply to furnish that small amount of power. I have in mind the starting up of a whole mill in order to do a little ventilation before the operatives go in there in the morning. This causes — I do not know exactly, but perhaps for half an hour the operations of a very large part, perhaps the whole of the shafting of the mill in order to bring in some fresh air; whereas, if a few motors could be attached directly to the fans at the places where they were required, the power necessary to operate them is insignificant and really of no consequence.

Unquestionably the use of storage batteries will increase; their principal field for mill work being the operation, without

attendance, of the small amounts of power required for lighting during the long hours of the night, thus permitting the shutting down of the entire steam or generating plant; also the storage battery will be of great use in carrying the peaks of load when they occur, thus reducing, in those instances, the installation and operation of generating apparatus. Their use will be still further increased on a larger scale as their first cost diminishes and we are content with smaller returns on investment in equipment to induce its introduction.

Mr. LOUIS SIMPSON. Mr. President, may I ask Mr. PAINE before he leaves, if there is any chance in the near future of the cost of storage batteries being reduced or of the company being content with a smaller return on investment?

Mr. F. B. H. PAINE. I do not know that I quite understand. The cost of batteries, the manufacture of them, amounts to a good deal more than the cost of lead and other materials entering into their construction; and I presume the storage battery people would say that they should have a fair return on their investment in their manufacture. What I referred to was the possible reduction in the cost of manufacture, some slight reduction, but more particularly to our being willing to make investments which will yield a return of five and six per cent. instead of requiring ten and fifteen per cent.

Mr. LOUIS SIMPSON. I think that my question was, if he saw any chance of the cost of storage batteries being reduced. I am not going into the question of their return on their investment, because I find that most of these electrical companies have their own ideas on those points. But I am very anxious to know when it will pay a cotton mill to buy storage batteries. When we come to the time when we can buy them with profit to ourselves, there will be, in my opinion, a great future for electric power.

Mr. F. B. H. PAINE. Under certain circumstances now, one of the most profitable things, unquestionably, that a mill can do, is to equip itself with a storage battery.

Mr. FRANK M. MESSENGER. I would like to inquire if any of the storage battery men are here — I notice Mr. PAINE spoke favorably in some instances of the storage battery — I would like to inquire if the storage battery has really been perfected so that it is a safe thing to install for power or light to any great extent? If any one here is able to tell us, I would like to hear from him.

Mr. ALFRED CLARKE. Mr. President, with regard to the capability of storage batteries and their suitability, the Edison Illuminating Company of Boston have now installed, or will have in about two months, about $317,000 worth of storage batteries. The storage battery has got to a point where its service is practicable and commercially economical. When you take the storage battery as a source of power — I mean for continuous power — the storage battery manufacturers do not claim that the economy is greater than that of the installation of a dynamo. But where considerable power is used for short periods — we will say, for example, a power is required for two hours of 1,000 horse power — now the cost of a plant that could be installed in steam and dynamos to be kept in reserve for that two hours during the day, would not be economical, whereas a storage battery could be charged at the rate of 100 horse power for ten hours, and its total power could be given out in one or two hours, as the case might be. The Electric Storage Battery Company of Philadelphia, now have plants of large extent. Taking the Edison Company of Boston, the Edison Illuminating Company of New York, the Pennsylvania Light, Heat and Power Company of Philadelphia, the Union Traction Company of Philadelphia, and a great many others which I could mention, we will see that the storage battery has been proved to be very efficient and economical, and in places where a storage battery is of service the return has been about thirty per cent. on the investment. Wherever it has been installed in places where its use could be fully taken advantage of, we have found that the plant has paid for itself in three years. Furthermore, the Electric Storage Battery Company is prepared to give two very

satisfactory guarantees: the first guarantee is that the battery shall perform the work specified, and the second guarantee that the maintenance of the battery shall not exceed six per cent. of the cost of installation. A depreciation of six per cent., I think, is commercially practicable, and I do not think any mill man would count on less depreciation on any part of his plant than six per cent., even on his machinery or steam or dynamos or anything else. I think that will answer Mr. MESSENGER'S question.

Mr. FRANK M. MESSENGER. Mr. President, I want to draw out this question, for the reason that my experience with storage batteries in a small way has been very unsatisfactory and that at the present time we have conditions which would seem peculiarly adapted to running them with economy; that is, since dispensing with gas we are obliged to run a small dynamo with a little high-speed engine (which is very expensive) all night, to light the boiler rooms and other dark places around the mill. But my experience with the storage battery is this: where you run it on a small scale you want about a $1,500 man to take care of a $500 battery.

Mr. LOUIS SIMPSON. Hear, hear!

Mr. FRANK M. MESSENGER. Perhaps we are not as apt and ready to learn at our place as we ought to be, but that has been our experience with a storage battery.

Mr. LOUIS SIMPSON. Mr. President, while we are on the subject of storage batteries, I would just like to explain to the members my experience. I made a study for two or three years, and as we happened to have the necessary expert men, it was a question to my mind whether we should not put in a plant for storage batteries, but after going to a great deal of trouble I found that the storage battery people asked more for their plant than I could install the necessary wheels and generators to obtain an equivalent. That is the reason why I asked our friend behind here [Mr. PAINE] when he thought that the prices would be so reduced that we would be able to adopt the system. I am very anxious to have storage batteries, and I do not object to paying 100 cents for a dollar.

Mr. ALFRED CLARKE. Mr. President, I would like, in reply to our friend from Grosvenordale [Mr. MESSENGER], to explain the matter by saying that his experience dated back some years ago.

Mr. FRANK M. MESSENGER. Yes.

Mr. ALFRED CLARKE. And that in the natural course of things storage batteries, like other matters, have been improved considerably, and it would be folly for me to profess that we could install a storage battery that would take care of itself, any more than I could sell a man a horse that would feed itself and groom itself and all the rest. Some reasonable intelligence must be used when a man buys a thing of that kind, in its management. I once heard a story of how a peddler called on a man and asked him to buy a gold pen. He said he did not know if he had any use for one, but the peddler assured him that he would find the gold pen much better than his steel pen, and he would leave one for two weeks for him to try. At the end of two weeks the peddler returned and asked the man how he liked it. The man said he didn't think he cared for the gold pen — he couldn't spell any better with it than he could with the steel one. Of course it was the fault of the pen we know. [Great laughter.]

Mr. FRANK M. MESSENGER. If my friend Mr. CLARKE had not given me away so badly I would not give him away, but I want to say that my experience is this: we employed a man from his place to come and take care of our battery, and we were disappointed. [Laughter.]

Mr. THEOP. W. WILMARTH. We have a plant where during the day we run both water and steam for power. Some time since we submitted to one of the gentlemen who has just spoken of storage batteries, that we would like to discontinue during the day using our steam engine and put in a storage battery, so that we could start our wheels and during the night store up that power and use it the next day. Owing to the city of Worcester taking the water of the Blackstone River, we have more water running over our dam between six in the evening

and six in the morning than we do between six in the morning and six in the evening. If the storage battery is improved the way Mr. CLARKE says it is, we are ready to install that plant at any time. I would like to hear about that.

Mr. ALFRED CLARKE. I will be very glad to meet you sir, after this meeting. [Laughter.]

Mr. THEOP. W. WILMARTH. I would like to have you state during the meeting.

Mr. LOUIS SIMPSON. And the price.

Mr. THEOP. W. WILMARTH. And the price; whether it is improved to that extent that we can figure on it. We could not then.

Mr. ALFRED CLARKE. I think that the statement I have just made covers the whole thing. We will guarantee that the depreciation shall not exceed six per cent. We are willing to insure it at six per cent.

Mr. THEOP. W. WILMARTH. Will Mr. CLARKE'S company guarantee that we can stop our boilers and engines during the day and use that plant to store power during the night?

Mr. ALFRED CLARKE. Certainly.

Mr. WOODBURY K. DANA. Mr. President, I would like to ask Mr. CLARKE how much it would cost to install a battery of ten horse power?

Mr. ALFRED CLARKE. That is a rather indefinite question. A storage battery is of a limited capacity. That is to say, a battery is measured by its horse power hour, not as a dynamo would be rated. A dynamo would be rated at ten horse power indefinitely, just so long as you turn the armature, whereas a battery is of limited capacity. The question of cost would be on the horse power hours of capacity.

Mr. WOODBURY K. DANA. I will make my question more definite by asking Mr. CLARKE how much it will cost to have a storage battery that we could charge so that it would run ten horse power for ten hours? We have the dynamos already, using them for light, with which we could charge the battery.

Mr. ALFRED CLARKE. It will cost about $45 per horse power hour for the installation.

Mr. LOUIS SIMPSON. For ten horse power for ten hours $4,500?

Mr. ALFRED CLARKE. Yes.

The PRESIDENT. We have a paper prepared by Mr. GOODALE, who wishes to read it by title. We wish he would read it in full, but he will probably give his reasons for not doing so, and at the same time he will read his paper by title and it will be incorporated into the Transactions. Mr. GOODALE.

Mr. ALFRED M. GOODALE. Mr. President and gentlemen, when I agreed to write that paper I made a stipulation that I should not have to read it, and I was rather wiser than I thought. My reason was this: I felt that the circumstances in connection with the growth of the factory system ought to be in our Transactions, and at the same time it seemed to me it was a very uninteresting subject to read to the Association. That was the chief reason why I did not care to read it. But I have been so busy that I have not completed it, and that is the additional reason. It is nearly done, however, and will appear in the Transactions.*

*The paper on the "Growth of the Modern Factory System," by Mr. ALFRED M. GOODALE, has been necessarily postponed until the Autumn meeting, and in its place is inserted a paper on "The Beverly Cotton Mill," by Hon. ROBERT S. RANTOUL, Salem, Mass., which was intended for presentation at the forth coming autumn meeting.—*Secretary.*

THE BEVERLY COTTON MILL — WAS THERE ANY BEFORE IT IN THIS COUNTRY?

ROBERT S. RANTOUL, Salem, Mass.

As Mayor of Salem, I was invited, not long ago, to enlist the co-operation of that cotton-spinning Massachusetts city in a movement to commemorate the fact that in October, 1790, at Pawtucket in Rhode Island, SAMUEL SLATER established the first cotton mill in the country, and by that token became the founder of the cotton manufactures of America. It seemed to me that as a Massachusetts man — a son of Beverly — I owed it to myself and to the truth of history to examine that claim and to inquire upon what grounds we were challenged to resign to another this coveted distinction. Massachusetts has too much to her credit to be greedy of honors which do not clearly belong to her. She believes that she can rightfully claim the establishment of the first cotton mill on this continent. If this distinction is hers she is not willing to forego it, for it becomes, day by day, a more interesting and conspicuous one, as our manufactures come to employ a growing fraction of the people of the country. This paper is written to show what sort of a cotton mill was put in operation in upper Beverly, Essex County, Massachusetts, in 1788, and was inspected by WASHINGTON on his northern tour in October, 1789.

The legislature of Massachusetts had interested itself, in the years 1786, 1787, before the Constitution of the United States had been adopted, in a series of efforts to introduce manufactures into this commonwealth, and the usual expedients of prohibitory duties, eastern land grants, lotteries and the like had

Washington's Visit to
The First Cotton Mill
October 30, 1789.

been resorted to. England had made great advances during our war of independence in the application of machinery.

Of course the production of cotton cloth by hand was nothing new. India and Egypt had used it for untold ages, and the Roman emperors made tents and awnings of cotton duck before the Christian era. The first applications of machinery for weaving "the wool that grows on trees" in this country were purely experimental, and singularly enough were exactly coeval with the introduction of cotton culture in the Southern States. Before this date the little cotton used here came from Barbadoes, Surinam, Pernambuco, Cayenne and those parts, and was mixed with linen or with sheep's wool and spun by hand. JOHN CABOT and Dr. FISHER, his business agent and manager, in petitioning the State for aid as late as 1790, advanced among the grounds of their appeal the claim that the raw material is procured from the West Indies in exchange for fish, "the most valuable export," they said, "in possession of the State." My venerable kinsman, WILLIAM ENDICOTT, recalls the day when raw cotton was sold by the pound in Beverly shops, to be employed at home like sheep's wool and flax in domestic spinning and weaving. All sorts of crudities were at first attempted. Some adventurers would card and spin in a mill and weave by hand. Some would make fabrics of cotton alone; some would use cotton with a thread of wool or flax—jeans were made of cotton with a linen warp, and jeans and corduroys were both made with the hand shuttle. It was only the most sanguine who hoped to make a perfected product of pure cotton produced wholly by machinery. Indigo, a southern product, seems to have been the only dyestuff, and South Carolina was still experimenting doubtfully in cotton culture in 1788—the very year in which Beverly was perfecting the manufacturing machinery which was to produce a finished fabric under a single roof. So these two great innovations were proceeding with equal pace—a combination of agricultural and mechanical forces destined to revolutionize the domestic habits of the country and almost to rend in twain the strongest government the world has ever seen.

In October, 1786, the honorable RICHARD CRANCH, a senator and brother-in-law of JOHN ADAMS, with Mr. BOWDOIN of the house, a son of Governor BOWDOIN of Massachusetts, afterwards minister to France and Spain, and others, were a committee "to view any new invented machines that are making within this commonwealth for the purpose of manufacturing sheep's and cotton wool, and to report what measures are proper for the legislature to take to encourage the same." They had no difficulty in discovering such machines, for samples had been brought to Boston for the purpose, and they reported, in November, a resolve which was passed, granting two hundred pounds to enable the BARR brothers, two Scotch weavers and machinists, then at Bridgewater, Mass., to perfect the apparatus exhibited, and also a roping machine and such other contrivances as were necessary for "carding, roping and spinning of sheep's wool as well as cotton wool." The legislature in a body then inspected the machines, commended the public spirit of the inventors, allowed their account to the amount of one hundred and eighty-nine pounds and twelve shillings, purchased their models, and gave them, instead of the promised two hundred pounds, six tickets in the land lottery of 1787.

In March, 1787, the State also granted twenty pounds more to encourage another Scotchman named THOMAS SOMERS, of whom we shall hear more, said to have been a midshipman in the British navy, to perfect apparatus for carding and spinning cotton.

The activity of some Boston merchants had prompted SOMERS to revisit England in 1785-6, a period when ARKWRIGHT'S patents afforded only a partial and insecure protection for his recent improvements, in the hope of bringing either machines or designs and models of machines for carding and spinning cotton to America. These he succeeded in bringing to Boston, and was rewarded by the legislature, as we have seen, for so doing.

The plan of government bounties was not a growth of this period. The General Court was busy as early as 1640 in efforts

to encourage the manufacture of linen and cotton. All idlers were required to work on wild hemp and flax to secure a better supply of clothing. The selectmen were ordered to see to it that the children of all families were taught to do the same. And they decreed a premium of three pence on the shilling on home products — a bounty of 25 per cent.— which failed and was at once repealed, like many later efforts of the kind, because the public burdens were too great at the time to bear it. In 1664 the legislature began to encourage the importation and culture of sheep for the increase of woolen fabrics, as well as the sowing of flax and hemp, and established a State agency for the purchase of cotton at Barbadoes. From 1648 to 1658 any commoner might keep sheep on his common's rights, but no sheep could be exported nor any sheep under two years of age killed save for family use, and the dog that killed a sheep was hanged. These and similar orders were published in open market at Boston by tap of drum. A manual training school was set up in Boston in 1656, for the improvement of youth in the manufacturing art. All women, girls and boys were required by act of legislature to spin, and a draft was ordered, assessing the work upon families at the rate of a spinner or a fraction of a spinner to each family according to numbers, and a spinner's quota was three pounds per week of linen, cotton or woolen yarn for thirty weeks in the year. Sheep's wool could not be exported. So the colony struggled on, offering bounties and resisting importation, until, in the middle of the eighteenth century the trouble with England gave a new stimulus to domestic enterprise and non-importation and home production became matters of necessity.

Such was the condition of things when the Beverly adventurers enter upon the scene.

The biographies of SAMUEL SLATER show that he first arrived in this country at New York, in November, 1789. Of course his establishing of cotton manufactures at Pawtucket must have been several months later than that. It is claimed that he established them there in October, 1790. The exact date at

which his machinery began to work I find to be Dec. 21, 1790, and I think no products of his mill were sold before the year 1791. Without the slighest disposition to disparage the man or the glorious work he did, it is easy, and I think it is worth while, to show from contemporaneous proof that when SLATER first set foot in Pawtucket, the shop-keepers of Salem and Beverley were retailing over their counters the finished products of the first cotton mill in America.

The *Salem Mercury* for April 15, 1788, made this announcement: "Several public-spirited gentlemen in Beverly have procured a complete set of machines for carding and spinning cotton, with which an experiment was made a few days ago, answering the warmest wishes of the proprietors. The spinning jenny spins sixty threads at a time, and with the carding machines forty pounds of cotton can be well carded in a day. The warping machine and other tools and machinery, part of which go by water, are all complete, perform their various operations to great advantage, and promise much benefit to the public and emolument to the patriotic adventurers."

And on May 6, 1788, the *Salem Mercury* reported: "The artists who introduced into Beverly the machines for carding and spinning cotton are Mr. LEONARD and Mr. SOMERS, who were regularly bred to the making and finishing of velvets, corduroys, jeans, fustians, denims, marseilles quiltings, dimity, muslins, etc. With such talents they supposed that the risk and expense of coming to this country would be amply recompensed by the encouragement such valuable manufactures deserve. But they made various applications with no other effect than loss of time and money. Such difficulties, co-operating with the want of energy and system in our governments, reduced them to the disagreeable necessity of resolving to leave a country so unpromising to manufactures, when the Hon. GEORGE CABOT generously patronized them and influenced a number of gentlemen in Beverly to associate for the purpose of establishing these much wanted industries. These gentlemen merit the thanks of their fellow citizens."

I find at the registry of deeds that on the 18th day of August, 1788, for the consideration of eighty pounds and five shillings lawful money, JOSIAH BATCHELDER, Esq., and HANNAH, his wife, conveyed to JOHN CABOT, merchant, and JOSHUA FISHER, physician, all being of Beverly, certain premises comprising five or six acres of land lying on "the road from Mr. OLIVER'S meeting-house to Beverly Ferry." Ten years later this estate, with certain buildings thereon standing, was deeded by CABOT and FISHER to SAMUEL BLANCHARD. It came in time into the hands of Hon. ROBERT C. WINTHROP. SIMEON BAKER'S tavern and well and the old Ipswich road figure as landmarks in the deeds of conveyance.

On this lot at some time after August, 1788, the Messrs. CABOT, FISHER and their associates, had erected a three-story brick building for the manufacture of cotton fabrics. The mill is not now standing. It is well remembered by living persons, and I have been enabled with their help to procure a representation of it. The late Dr. ANDREW P. PEABODY, of Cambridge, remembered it, and says, in a sketch of Dr. FISHER, in his "Harvard Reminiscences," that it was built in 1788. WILLIAM ENDICOTT, the oldest resident of Beverly, remembers it and saw it burn. ABRAM CALDWELL, born near it and the oldest resident of Ipswich, writes me a letter minutely describing it. Other living witnesses attended school in it after the War of 1812-15, when it was last used for manufacturing purposes. The *Salem Gazette* of Oct. 14, 1828, says: "The brick factory, with the barn and sheds attached to the Baker tavern, in Beverly, were burned down, and the tavern was on fire when the Eastern stage came through Beverly last evening." And the *Essex Register* of the 16th adds: "The fire first started from the chimney of the tavern just before dark, during a violent gale, and consumed the brick building near by, formerly used as a cotton factory."

Before the purchase of this ample property the Beverly adventurers had petitioned the legislature, June, 1788, for an act of incorporation. The petition sets forth so clearly the whole scope and nature of their enterprise, that I must quote parts of

it. The petitioners say that the commonwealth has reached a point in population and agriculture at which it becomes necessary to establish manufactures. That no kind of manufacture appears more practicable at present or more useful than that of cotton. The principal part of the labor is performed by machinery. Many of the machines are applicable to the manufacture of silk, hemp, flax and wool. It will afford employment to a great number of women and children, many of whom will otherwise be useless, if not burdensome, to society. Induced by these considerations they have endeavored to ascertain by actual experiment on a small scale the probability of success in attempting this manufacture. They find it in their power to fabricate any kind of cotton or linen goods equal in quality to any made in Europe and much superior to those usually imported. Cotton may be procured here as cheap or cheaper than in Europe. Linen yarn, machinery, and labor in general, will be on an average about 50 per cent. higher. They are of the opinion that, although the balance cannot be greatly in favor of the business, yet it will afford such profit as to support itself, excepting the extraordinary expenses attending its introduction. This expense they conceive to be really lost by the first undertakers and, if the art be valuable, gained by the community. They therefore conceive that it is necessary to the establishment of such a manufacture that the legislature should grant some peculiar favors to the first adventurers, otherwise to them even success will be attended with a considerable loss, a sacrifice which, they presume, the community cannot reasonably expect. They pray the General Court to take the premises into their consideration and to grant them a charter with such immunities and favors as they in their wisdom shall think necessary to counterbalance the disadvantages and expenses peculiar to the introduction of this manufacture. The signers were JOHN CABOT, GEORGE CABOT, DEBORAH CABOT, ANDREW CABOT, MOSES BROWN, NATHAN DANE, JOSHUA FISHER, THOMAS SOMERS, ISRAEL THORNDIKE, JAMES LEONARD, HENRY HIGGINSON and ISAAC CHAPMAN.

This petition was committed June 6th, and on June 17th it was referred, on a report of the committee, to a sitting of the General Court, which began in January, 1789. In February, 1789, the adventurers not only procured a charter, with leave to hold real estate amounting to ten thousand pounds, and personal estate amounting to eighty thousand pounds, but also received an elaborate indorsement of their enterprise, coupled with a grant of aid in the form of a "resolve for encouraging the cotton manufactory at Beverly." So that there was at Beverly, in February, 1789 — SLATER had not then set foot in America — something which the legislature of Massachusetts saw fit to describe as a cotton manufactory, and thought worthy of encouragement. The resolve set forth in its preamble the necessity of introducing such manufactures as will employ the citizens of the commonwealth — check those emigrations which are ruinous to the State, and increase the number of manufacturers, who by consuming the productions of the soil will add to the value of it; and it proceeded to grant to the incorporators the value of five thousand pounds, lawful money, in specie, to be paid in the Eastern lands, the property of this commonwealth. Among the eminent petitioners for incorporation was the Hon. GEORGE CABOT, a brother of JOHN CABOT, and a man of national reputation whom I need not pause to characterize. When our navy department was created, during the presidency of JOHN ADAMS, the cabinet portfolio was first offered to GEORGE CABOT. To his personal friend, ALEXANDER HAMILTON, then first secretary of the treasury, and also to our first member of congress, BENJAMIN GOODHUE, Mr. CABOT wrote, in 1790 and 1791, that the Beverly undertakers were engaged in the cotton enterprise as early as October, 1787, and that they were the only persons who had prosecuted the business to any effect. Congress was invoked to aid the mill by a national lottery (this as early as March, 1790), and Mr. CABOT says that forty people are employed in it, and that Rhode Island undertakers are already appropriating their experience and skilled labor.

On January 6, 1789, the *Salem Mercury* mentions a promising

cotton manufactory in Beverly. It is plain that the projectors, since securing a location the August before, had lost no time. They erected on it a plain, three-story building of brick, measuring about sixty by twenty-five feet, with a pitched shingled roof, and a deep basement, in one end of which moved a heavy pair of horses to furnish power. In the northwesterly corner of the lot stood a small wooden dye-house, which either disappeared in the fire or has been converted into a dwelling. The brick mill stood seventy feet behind and parallel with the rear line of the tavern yard. Between the factory and Ipswich road was a famous well of water, with well sweep and curb, from which the neighboring inn supplied itself, and WASHINGTON is recorded as drinking. Apprentices were received as early as June, 1789, and in 1790 the Beverly factory sent out a mechanic to introduce its machinery in Connecticut. Beverly had, by a vote of the town in 1788, excused the foremen at the factory from paying a poll-tax, and in October of that year, in another vote, spoke of "the cotton manufactory that has been lately set up in this town." But before the close of the historic year 1789, the birth year of our federal government, an event occurred of most fortunate omen for the infant enterprise. On the 30th day of October in that year, WASHINGTON took breakfast with GEORGE CABOT at his house in Beverly, and afterward rode out to visit the cotton mill on his way to Portsmouth. Nothing could have given more encouragement and publicity to the patriotic experiment.

The *Salem Mercury*, of November 3, 1789, printed before Mr. SLATER'S arrival in America, says this of WASHINGTON'S visit: "As he passed through Beverly he visited the cotton manufactory in that place. He was shown in the lower story a jenny of eighty-four spindles, upon which some of the manufacturers were spinning warp, and three or four other jennies upon which they were spinning weft; and about a dozen looms, upon which they were weaving cotton denim, thicksett, corduroys, velveret, etc. In the middle story were seen a roping jenny of forty-two spindles, and a machine on which a person usually doubles and

twists in a day a cotton warp of fifty yards. In the upper story were exhibited the business of carding, warping and cutting, and in a contiguous building that of dressing on the stove. The whole evincing such proofs of industry, ingenuity and improvement as offered that illustrious patron of the arts, who was himself clothed in a suit of American manufacture, the highest satisfaction.

"The quantity of goods made there amounts, according to information, to about ten thousand yards. These goods are mostly a coarse fabric, the first essay of our countrymen in learning the art, but they have been found by frequent trials to be remarkably strong and durable — those lately woven will probably be equally handsome with foreign manufacture of that kind and superior in every other respect."

WASHINGTON had passed the night in Salem. On Friday morning, in compliance with the universal wish of the people, that the most majestic figure of the time might be seen once more on horseback, he had mounted the white charger at the steps of the Ward mansion, in the street which ever after bore his name, and proceeded to Beverly. He dismounted first to inspect the draw of the just-completed bridge of which his friend and long-time correspondent, GEORGE CABOT, had been the chief promoter, and again for breakfast at the Cabot mansion. Here HENRY CABOT, the little son of the host, the grandfather of Senator LODGE, his namesake, who tells the story, hid himself under the mahogany and watched with breathless scrutiny every look and gesture of the "Father of his Country." Breakfast over, WASHINGTON was again in the saddle and only surrendered the charger to his colored groom on leaving the cotton mill.

At the cotton mill WASHINGTON was attended by a bevy of young women, the attendants at the mill being generously reinforced for the occasion by hosts of friends, all eager to demonstrate the processes and exhibit the machines with a never-forgotten sense of delight. Having slaked his thirst at the well the illustrious guest resumed his traveling carriage for Newburyport and Portsmouth.

But before night WASHINGTON had made the daily entry in his journal. It was in these words: "Friday, October 30th, a little after eight o'clock, I set out for Newburyport, and in less than two miles crossed the bridge between Salem and Beverly, which makes a handsome appearance. (He then discusses the bridge at some length and resumes.) After passing Beverly two miles we come to a cotton manufactory which seems to be carrying on with spirit by the CABOTS (principally). In this manufactory they have the new invented carding and spinning machines. One of the first supplies the work and four of the latter, one of which spins eighty-four threads at a time by one person. The cotton is prepared for these machines by being drawn lightly to a thread on the common wheel. There is also another machine for doubling and twisting the threads for particular cloths; this also does many at a time. For winding the cotton from the spindles and preparing it for the warp there is a reel which expedites the work greatly. A number of looms (fifteen or sixteen) were at work with spring shuttles, which do more than double work. In short the whole seems perfect and the cotton stuffs which they turn out excellent of their kind, warp and filling both cotton."

Fortunately, however, the claim of Beverly does not rest solely on this evidence, impregnable as it is, for WASHINGTON'S diary fixes not only the disputed date, but gives the exact character of the machinery in operation and of the fabrics produced. Nor does it rest alone on contemporary evidence of journals of the day, although they were from the first of December, 1789, advertising for sale the products of this mill in great variety. In Beverly, Baker & Allen were warranting the corduroys as equal for service to any imported, and at as low a price. And in Salem, at the store of FRANCIS CABOT and elsewhere, might be bought, besides corduroys, royal ribs, thicksetts, stockinnette and ribdelures of different qualities and prices, by wholesale or retail, all manufactured in Beverly and warranted to be lower in price than any English goods of the same kind and quality to be found in the State. FELT, the infallible annalist of Salem,

says that in 1790 the wear of the Beverly corduroys had become very common, while the biographers of SLATER make it pretty certain that he had produced no textile fabrics ready for the market before 1791.

But finally we have in addition to all this an explicit declaration from the leading spirit in the Pawtucket enterprise to the effect that Beverly was ahead of him.

MOSES BROWN, an eminent Quaker capitalist of Providence, was from the outset the head and front of SLATER'S undertakings. He it was who invited him from New York. He established him at Pawtucket, and he at once began a correspondence with his namesake, MOSES BROWN, of the Beverly adventurers, craving sympathy in the discouragements which tried his Quaker equanimity, and especially asking co-operation in petitioning congress and the States for aid and legislation. In an early letter of this kind Mr. BROWN, of Providence, writes: "I have for some time thought of addressing the Beverly manufacturers on the subject of an application to congress for some encouragement to the cotton manufacture by an additional duty on the cotton goods imported and the applying such duty as a bounty partly for raising and saving cotton in the Southern States, of a quality and cleanness suitable to be wrought by machines, and partly as a bounty on cotton goods of the kind manufactured in the United States, and it is the desire of those concerned this way *that you, being the first and largest*, would take the lead and devise such plans as may be most eligible."

All honor and grateful remembrance to SLATER and the noble company of pioneers who, in 1790-91, by their energy, persistency, shrewdness, courage, foresight and public spirit, set in motion at Pawtucket the mighty enginery of cotton spinning. They builded better than they knew. The vast changes their enterprise effected in the cleanliness and comfort of toiling millions — the toiling millions to whom their industry was destined to give work and bread — it was not within the scope of human prescience to foresee results like these; results which give cotton spinning a place among inventions like printing and the

locomotive and vaccination and gunpowder and the electro-magnet and the compass and the sewing-machine and ether. The future was not unveiled to them, but they persevered. They have their reward. We know too well the misadventures, the discouragements, the anxieties and perplexities which test the manhood and endurance of pioneers like these. But there is nothing more certain than that they followed the lead of Beverly in this world-redeeming industry. While they surmounted gigantic obstacles and justly receive the plaudits of their posterity the same meed of praise is to be awarded, even with an added unction, to those explorers who sailed before them, without a compass and without a pilot, on that troubled sea. The country profits by the enterprise and sacrifices of both, and if the Beverly undertakers were not destined to become the fathers and founders of the cotton industry in America they had at least accomplished — before SLATER reached America — more than a year before SLATER'S enginery was set in motion in Pawtucket — that which challenged the admiring scrutiny of the "Father of his Country."

The PRESIDENT. The next paper on our programme is "Recent Advances in Weaving," by Mr. WILLIAM G. NICHOLS of Clinton.

Mr. NICHOLS read the following paper which was illustrated by the stereopticon:

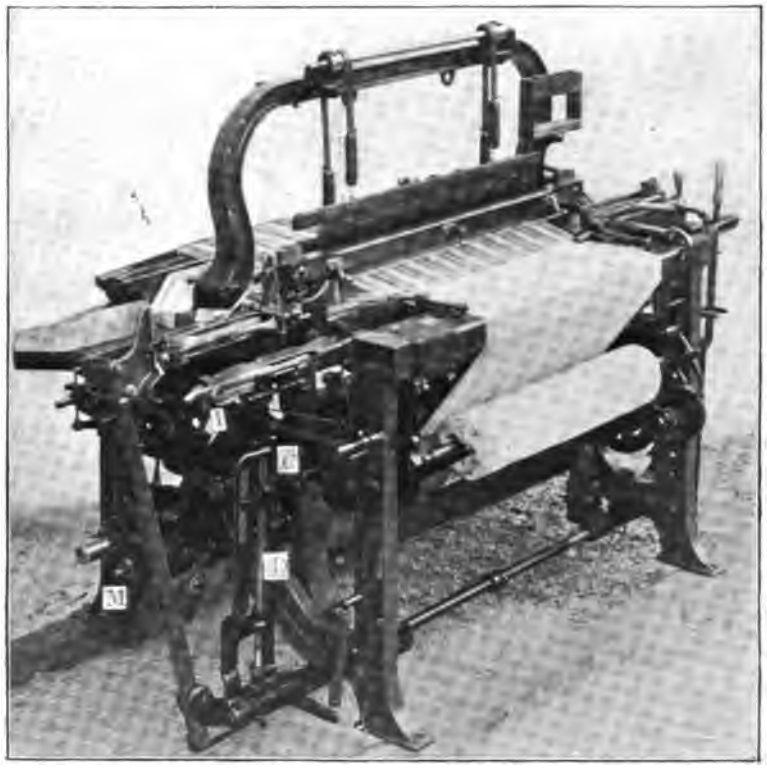


FIG. 1.—SHUTTLE SHIFTING LOOM.

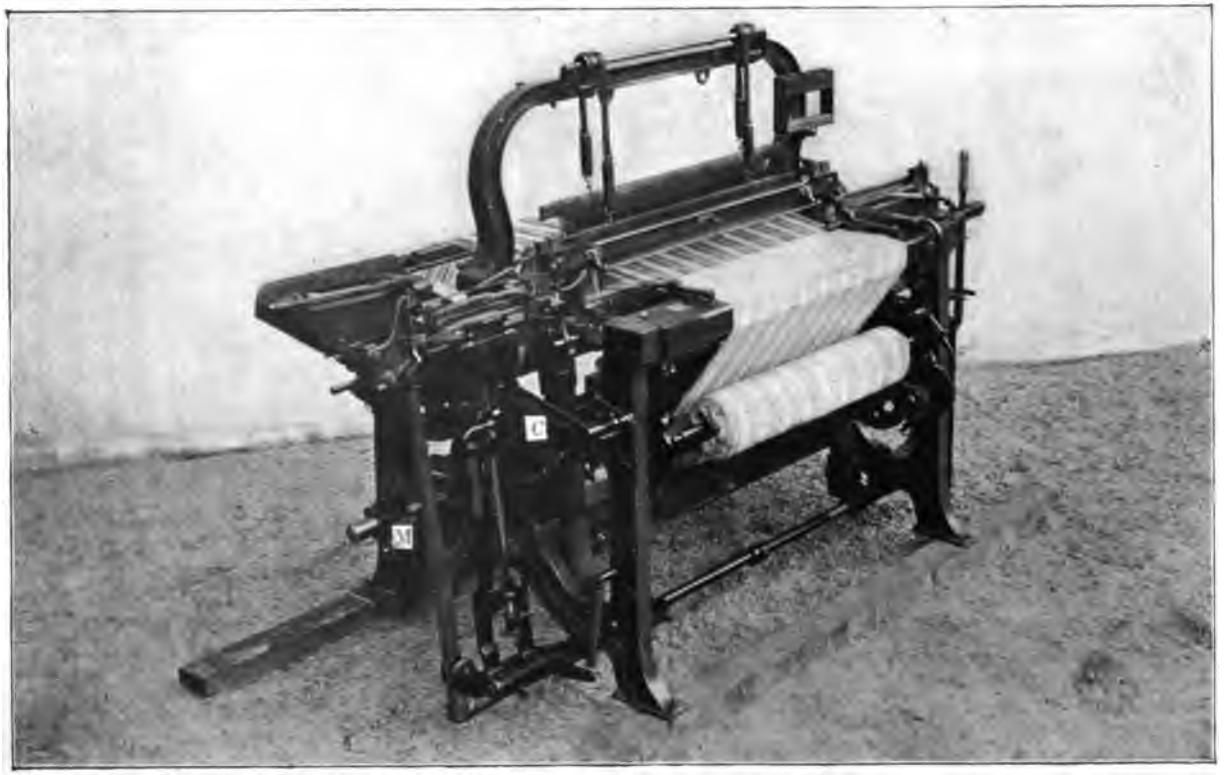


FIG. 2.—SHUTTLE SHIFTING LOOM.

RECENT ADVANCES IN WEAVING.

WILLIAM G. NICHOLS, Clinton, Mass.

It is related in that amusing book "The Innocents Abroad," that when the guide, who conducted the touring party, exhibited at some place the relics of ancient times, he was treated with disdain, and was told that if he had any good fresh corpses to trot them out, but they didn't care to spend their time looking over musty antiquities.

I am afraid that anyone who attempts to treat of advances in weaving will find upon further examination that even the most beautiful and complicated products of the loom contain no new principle, and do not excel in fineness fabrics that have been woven very many years, and that in the minds of some he may be thought guilty of exhibiting, as new, fabrics containing ideas worked out long years previously.

Nevertheless, it is not true that we have made no progress, for new combinations are produced in such rapidity and variety that he who is most familiar with them can hardly keep in touch with their many and changing forms.

I do not suppose that there are many mill managers here who will question the statement that the most remarkable advance, in recent years, is the Northrop loom. From the first it has aroused wide-spread interest, which has by this time, in many men, developed into a belief in its great practical benefit, and sufficient confidence to lead to its extensive use.

Other machinery builders believe in its utility also, and are adapting their looms to receive it, if desired, later. The looms of the Whitin Machine Works, Mason Machine Works, Lowell

Machine Shop, Kilburn, Lincoln & Co., Crompton & Knowles Loom Works, and Lewiston Machine Co., are now so made. We do not imagine that even its promoters believe that it is perfect, and that wider experience will not modify it somewhat. Very likely the mechanical details will be changed a great deal, but the main ideas involved are practicable, and already other machines for accomplishing the same results are being put forth, from the east even to the California coast.

As the advantages of the use of this loom have been fully set forth at previous meetings I will not dwell further upon them now.

There have been many minds at work upon some device for changing the shuttle instead of the bobbin, and the Crompton Loom Works have ready for the market a loom built on this principle, which embodies some new ideas and some old and tried mechanical movements for its accomplishment. Figure 1 shows a view of this loom.

In this loom two boxes are provided at one end of the lay. They may be described as a two-cell drop-box split in two. The lower one is shown at *I*; it is upon a lifting rod *D*, and is raised and dropped by the two drop-box motion, essentially the same as used on their two by one box looms. While the loom is weaving, an ordinary shuttle with a full bobbin of filling is placed in the holder or lower half of the two-cell box, as it is held forward by the catch *C*, where it remains until the filling in the shuttle in use either breaks or runs out. If the filling has run out, the fork, instead of stopping the loom, releases the catch *C* and sets the box motion in operation. When the lay comes forward it receives the shuttle holder into the space below the shuttle box. While the lay is moving backward the holder is raised into the place of the shuttle box, the box itself is pushed up, and the shuttle thrown out of the back which is open, on to the shelf as shown in Figure 2. The holder having taken the place of the shuttle box by this time, the loom is ready to pick. The new shuttle is thrown across the warp in the usual manner. While the lay is coming forward the holder

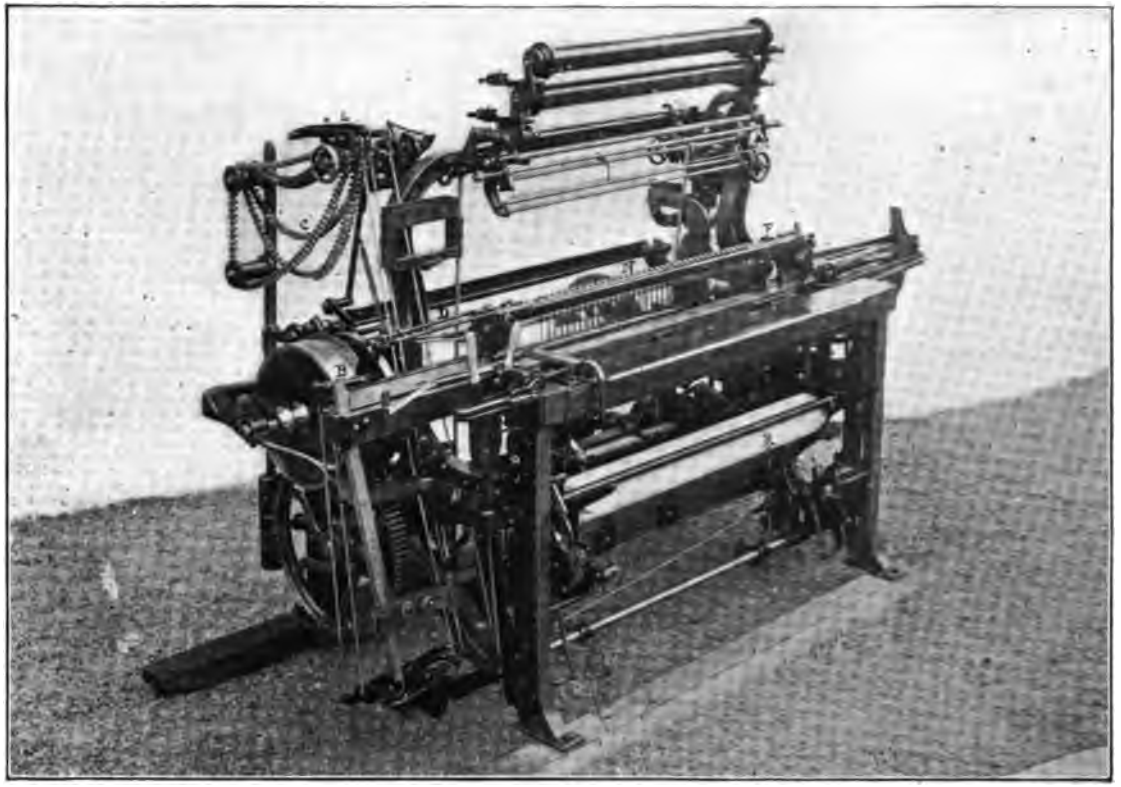


FIG. 3.—LAPPET LOOM, FRONT VIEW.

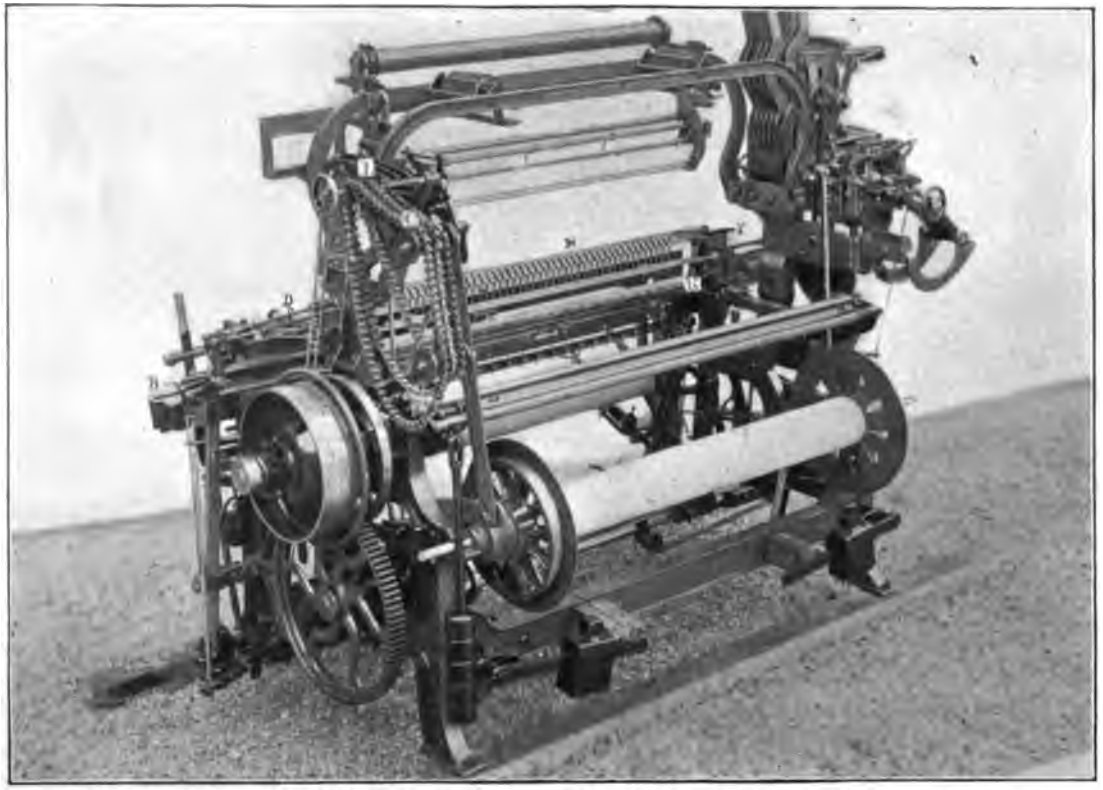


FIG. 4.—LAPPET LOOM, REAR VIEW.

is lowered by the box motion, the empty shuttle box drops into place, and is ready to receive the shuttle when thrown from the other end of the lay. When the holder comes forward it is held by the catch *C*, ready to be filled with a fresh shuttle.

I think that even the superficial observer will find, in our New England mills, advance in two directions. First, toward a greater fineness in product, and in the second place, toward a greater variety of organization and complexity of construction.

Up to within a few years it has been necessary for those in need of very fine cloths of even a plain weave, to use goods imported from France or England. But the close competition of southern mills, in goods of medium fineness and quality, and the greater profits in the manufacture of finer goods, have already carried us so far that it appears as though we would very soon be able to make goods of any fineness needed for practical use.

There are now a good many mills making yarns for weaving of about No. 100, and a few of them nearly 200. I do not know how fine the thread mills have been spinning, but I think it is only within a year that some of the cloth mills in New Bedford and Fall River have been spinning as high as No. 150, and the finest that I am aware of at the present time is about 170 or 175. The two samples which I have here are the finest that I have been able to obtain, and their organization is as follows:

Swatch No. 1, a nainsook: warp yarn, No. 100; filling yarn, No. 120; sley, 111; picks, 136; weight in 36-inch goods, 10.40 yards per pound.

I was told that domestic nainsook as fine as this had been on sale but a few weeks.

Swatch No. 2, "Swiss" muslin: warp, yarn No. 120; filling, 160; sley, 96; picks, 120; weight in goods 36-inches wide, about 14 yards to the pound.

In comparison with this the finest imported goods that I have found are: warp yarn, 220; filling yarn, 235; sley, 92; picks, 90; weight in 36-inch goods, 28.3 yards per pound. These goods are woven across the water upon a hand loom.

The finest cambric or muslin I have seen was: warp yarn, 160; filling yarn, 210; sley, 141; picks, 150; weight in 36-inch goods, 13.9 yards per pound.

The activity of the print works has, no doubt, done a great deal to stimulate the production of fine white goods, both plain and fancy weaves. The beautiful, varied, attractive and inexpensive lines of goods put out by them, has had its reflex action upon woven-colored goods, and in part explains the stagnation of the market on these fabrics.

In colored woven goods it is possible to obtain certain effects and qualities not made in printed fabrics. In the finer grades the lightness of weight, softer tones, and more delicate shadings of color, make them much superior to the old standard ginghams. But the condition of business has been against improvement in colored goods during the past few years, so that the progress in the matter of fineness of texture and artistic patterns has missed the incentive it would otherwise have had.

Swatch No. 3 is as fine as any I have been able to get: warp yarn, 50; filling yarn, 50; sley, 90; picks, 80; weight in goods 36 inches wide, 6.5 yards per pound.

The famous Anderson Scotch ginghams are about 50 warp yarn, 55 filling yarn, 90 sley, 90 picks, 6.46 yards per pound, 36 inches wide.

The dull market of the last five years has been like the lean kine in Pharoah's dream, which devoured the fat kine which came up out of the river before them. But its result has been a marked advance in the direction of novelties in fabrics and designs.

The unprecedented sale of dobbies, the greater number of harnesses used in them, running up now to 24 or 25 where formerly 6 or 8 was a common number, the fact that looms are now made in such manner as to readily receive dobbies or jacquard heads, and the wider demand for novelty yarns for cotton goods, evidence the increased effort of designers to produce styles which will be attractive and lead to business.

One of the most successful of the recent developments is

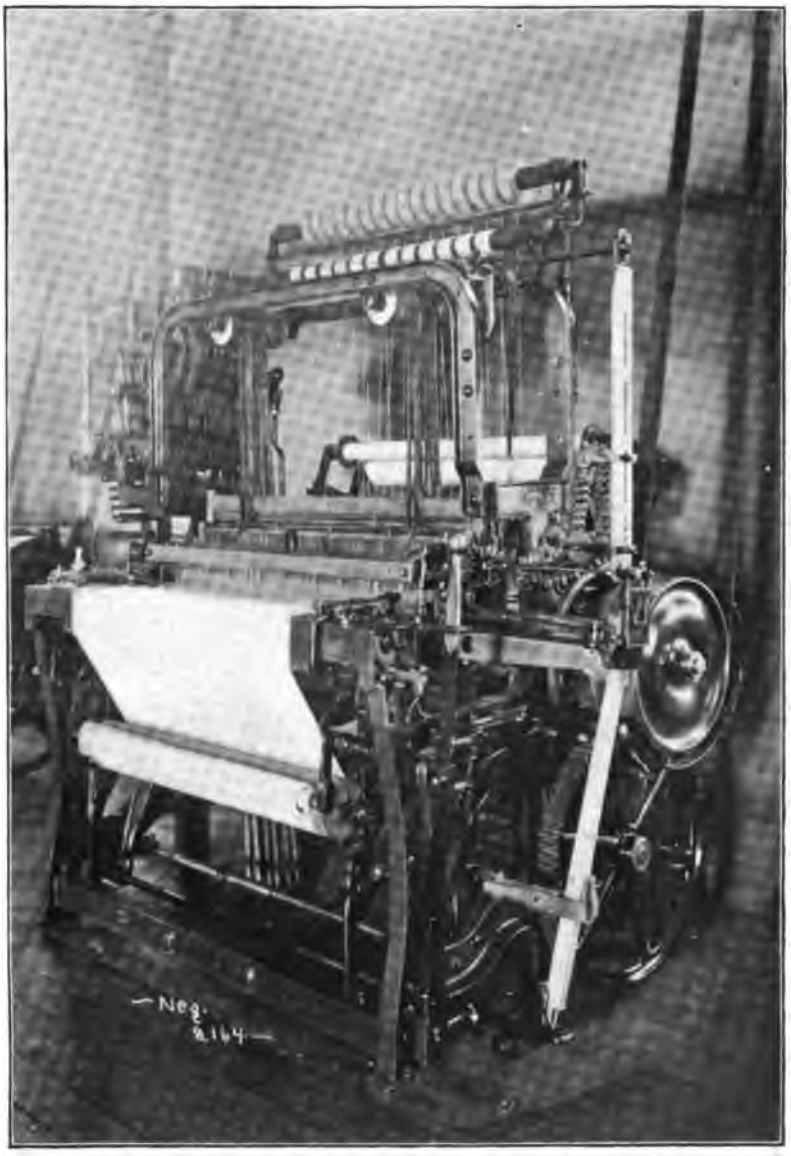


FIG. 5.—LAPPET LOOM.

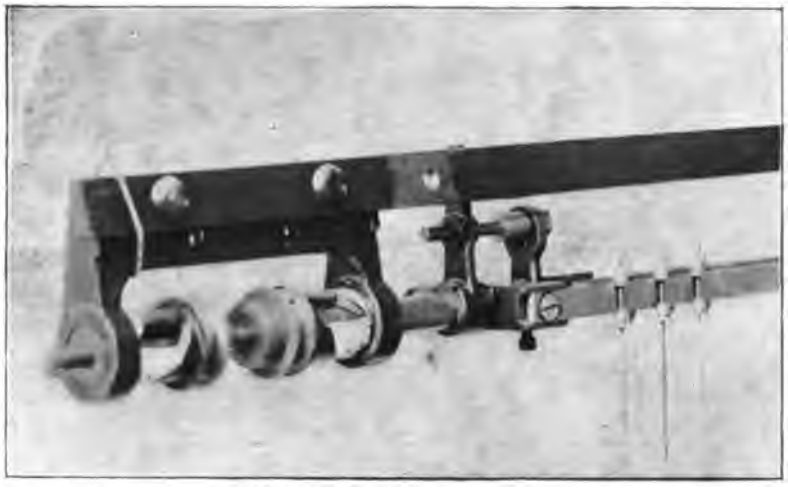


FIG. 6.—LAPPET LOOM, NEEDLE MECHANISM.

lappet work. This style of weaving is not new, as occasional samples of it have been seen in our market for some years. It was practised in Dracut in 1846, and to my certain information has been in use in England for considerably over a century. However, the sudden demand for it has brought out various machines for producing it, to make some very attractive goods.

Cuts 3 and 4 show the loom most in use for weaving lappets. Cut 4 is a four-cell drop-box loom, and cut 3 a plain loom with dobby. It is a practical departure from the old English and Scotch looms, in that the pattern is made up on a chain, in place of a cam wheel, and the needles descend in front of the reed, instead of coming up from below.

In the photograph the pattern chains which are made of bars of various heights, run over a cylinder at *L*. If a high bar comes up by the turning of the chain, it raises one of the levers at *L*. These are connected by wires and levers to the bell crank levers at *B* on the end of the lay, and the vertical movement of the lever *L* is converted into a horizontal one, and imparted to the needle bars by the connecting rods at *D*. When the horizontal motion is reversed the springs on the connecting rods *D* actuate the movement of the bars and keep the levers down against the chain. The ends of the needle bar slide in blocks *F* fastened to the rods *R*. On the rod is a stud attached to one end of a link; the other end of the link is attached to a stud on the loom frame. The position of this stud is such that the backward movement of the lay, away from the stud on the frame, causes the link to draw down the rods and needle bars, while the shuttle passes over the figuring threads. A give away connection is provided, that no harm may be done when by chance the shuttle has stopped on the race. A latch motion is also provided by which the needle bars may be locked up for any number of picks, and a plain weave made between spots. The loose floating threads are clipped off in finishing the cloth.

As in the foreign machine, the shuttle is guided in its flight across by pins set in a bar at *K*, and rising through the holes in the race plate by a movement the opposite to that which depresses the needle bars, and at the same time.

The figuring threads are wound upon rolls set above the arch, and an ingenious tension device is provided.

Swatch No. 4 is a sample of goods woven on this loom and afterwards printed. This a popular manner of using lappet work at the present time.

Cut 5 shows another form of a lappet loom, made for two frame work only. In this cut are shown the various lengths of pins in the pattern chain, which is carried over the shuttle box at the end of the lay. These pins pass before cheek pieces attached to the ends of the needle bars, which are held against them by springs, and according to the length of the pin the bars are worked backward or forward. The needle bars are behind the hand-rail and attached to rod *D*, which is depressed by a lever, worked by a cam shaft, or by a harness jack of the dobby if preferred. The figuring warp is wound on rolls placed above the arch, and passed down behind the harnesses, over a rod and forward through the reed and needles. No tension device is needed.

As shown, this loom is weaving a combination of leno and lappet work, face upward.

Not only have the Crompton & Knowles Loom Works produced four different styles of lappet looms, but there have been some imported from abroad. The Mason Machine Works have made some, and the Gilbert Loom Works are now putting out an attachment for ordinary looms, containing some novel ideas, and of which Cut 6 shows the principle applied.

The pattern is made by chains, as in the other modern lappet looms, and the vertical motion is converted into lateral through the wires to the foot of the lay, thence upward to the straps on the rolls at the end of the needle bars. The strap is attached to this roll by a screw in the same manner as a harness strap to the top roll. The roll is made in two parts, fitting together on a bevel or wedge surface. The part to which the strap is attached will turn with the round shaft while the other will not turn but is attached to the end of the needle bar. When the lever is raised by the chain the strap is drawn downward, giving

FIG. 7.—DROP BOX MECHANISM.

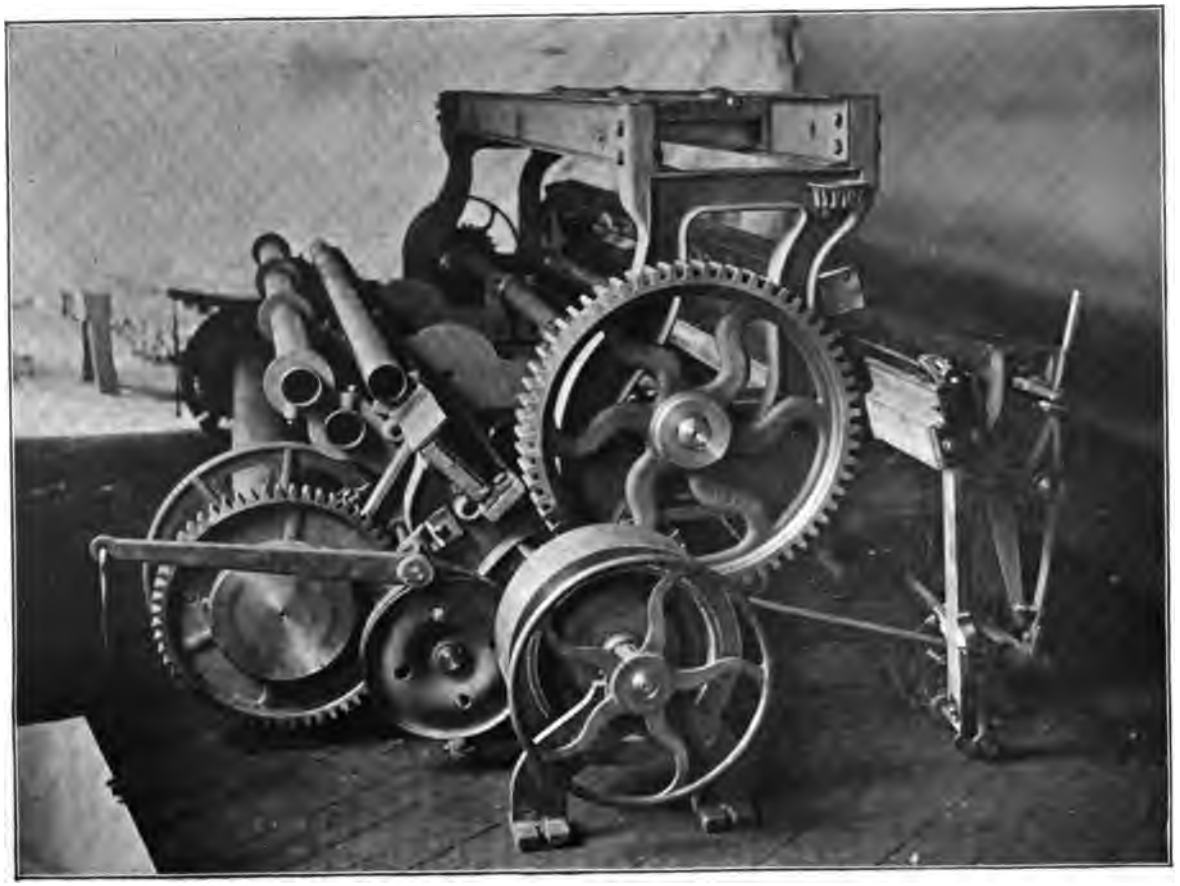


FIG. 8.—DUCK LOOM.

a rotary motion to one-half of the roll, when the beveled face against the other half forces it and the needle bar in a lateral direction, varied by the distance the lever is raised by the chain. When the needles are down they are in front of the reed, and the shuttle passes along in front of them, without the row of pins commonly used. The needle bars are attached to a round rod, and when the shed is opening and closing the rod is given part of a revolution, by which the needles are swung forward out of the way of the warp, as shown in the figure.

Swatch No. 5 is a sample of lappet work. In swatch No. 6 we have a good lappet imitation of swivel weaving. Swivel weaving, in cotton goods, is an art not practised in this country, so far as I am aware, at any rate not in New England. Some years ago two or three colored goods mills made some unsuccessful experiments in this line, and I have a sample of the work done. But the complicated nature of the mechanism, and the sad results on the warp in case of anything going wrong, caused such low production that it was a failure.

There are not wanting signs that the next move will be in the direction of swivel work. It is not now made here. It brings good prices, and there is a demand for the machinery. The Crompton-Knowles Loom Works will soon have ready for the market a loom for these goods.

The lines of imported goods, for the past two seasons, have shown some very good samples of swivel work. Swatch No. 7 is from some of the work done on the new loom of the Knowles Loom Works. This loom will be suitable to manufacture the dotted muslins which are now imported, and for which there is a fair but constant demand.

Another form of weaving which has been occasionally seen here, is whipnet, although it has been more in evidence during the last year or two than ever before. At first glance whipnets somewhat resemble ordinary leno, but they are much more difficult and intricate.

A sample in my possession is the most beautiful specimen of the art of weaving, in white cotton goods, that I have ever seen.

The count is about 100 by 115, and some of the yarns must be nearly two ply two hundred or finer.

Fancy weaving has advanced in another direction during the last few years, by the use of various other yarns and fibres to work with cotton. Most of us remember the so-called swivel silk, which had a cotton warp, of some time ago, which may be cited as an example.

Linen, wool, worsted, mohair, silk and tinsel are finding uses in what have been, heretofore, strictly cotton mills, to produce dress goods and other novelties. And an apparently successful venture is the line of Crispene Suitings, of which the filling is a paper yarn somewhat finer than that in use in carpets. Swatch No. 8 is a sample.

Two other excellent illustrations are shown in swatches No. 5 and No. 9. In the former there is a cotton warp, a linen filling and a lappet figure in spun silk threads. The latter has worsted yarns in an overshot weave on a cotton ground work.

The popularity of this overshot effect in dress goods has afforded an unusually good field for dress goods made of cotton and worsted, and even for those in which the worsted itself has been made of cotton; but shirtings, napped goods, linings, upholstery, etc., have all shown the same tendency.

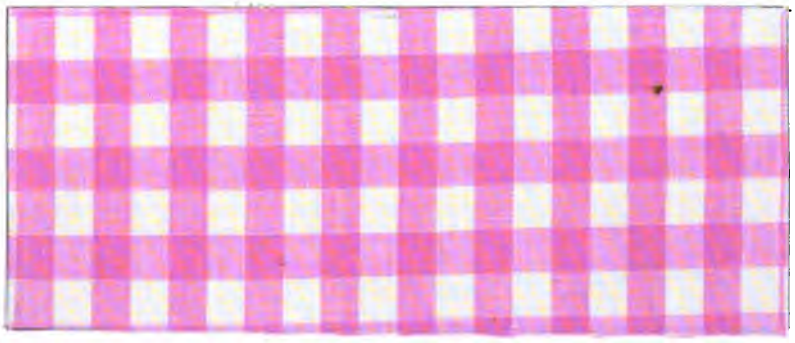
As various as have been the attempts to improve the market for cotton goods, so have been the endeavors of the machinery men to perfect the mechanism for weaving. Various positive motion shedding engines have appeared; the Mason Machine Works and Gilbert Loom works are perfecting them. Messrs. Kilburn, Lincoln & Co. have a new box motion nearly ready for the market.

The warp stop motion is receiving extensive trial on colored work, apart from the filling changer, with which it was first introduced. And it is an open secret that we may ere long expect the filling battery applied to the drop-box loom.

There are a great number of fabrics woven on dobby looms with box motions, in which the color in the filling changes with the harness weave. In such weaves, if the box motion fails to

No. 1.

No. 2.



No. 3.

keep in harmony with the harness chain, and moves one pick forward or backward, the result is a misweave. For example, in a fabric such as I have lately seen weaving, having a double face, with backing filling of blue and face filling of white, the back filling may be thrown to the face and spoil the effect; or in a zephyr, having a colored satin bar across a plain cloth, the ground filling may run over into the satin bar, and the satin filling into the plain cloth; or in some goods like Swatch No. 9, the particular effect may be spoiled. To obviate this it has been customary to work the box motion by a strap from the harness levers, attached in various ways; but these are more or less unsatisfactory, and if the harnesses are all needed for the patterns, impossible. Mr. J. F. DUSTIN, of Fitchburg, has invented an attachment, shown in Figure 7, for keeping the two motions together and preventing the wrong filling being called into the shed. There is a short cylinder on the outside of the dobby frame, and chain similar to a harness chain, but with shorter bars, is run over this. The pins lift the levers *A* connected by wires to latches behind *E*. A cam plate on the crank pin gear operates knives which catch in the hooks of the latches *B*, and through the toggle joints *E* throw the gears of the box motion in or out, as the chain is pegged. The ordinary roller chain, multiplier and connections are done away with. This mechanism may also be worked from levers, over pegs in the regular dobby harness chain, if desired. As this will work on the pick, it never fails to bring the proper box into play, and renders the weaving much easier.

A limited market is found for a loom heavier, perhaps, than is run in any mill represented here, and containing some features not usually necessary in weaving machinery.

A duck loom for weaving cloth ten feet wide, and weighing a half ton to the hundred yards, needs to be very strong and rigid. The Gilbert Loom Works have recently shipped to England, some looms of this class, using wrought iron beams for the arch and to support the whip roll.

While invention has been largely devoted to new devices,

there has been for many years a more quiet progress in machinery building, in the direction of simplicity, convenience and economy of labor and supplies, for changes and repairs. The change which has brought larger sliver cans in the card room, and larger bobbins in the spinning room, has brought larger beams in the weave room and larger space for the cloth roll in front of the loom. The Whitin Machine Works claim to wind up 800 yards of cloth. They also put out a loom for twill work with the cams at the end, and outside after the manner of the English. They, moreover, arrange to take up one or two picks per tooth of pick gear, to effect an economy of supplies.

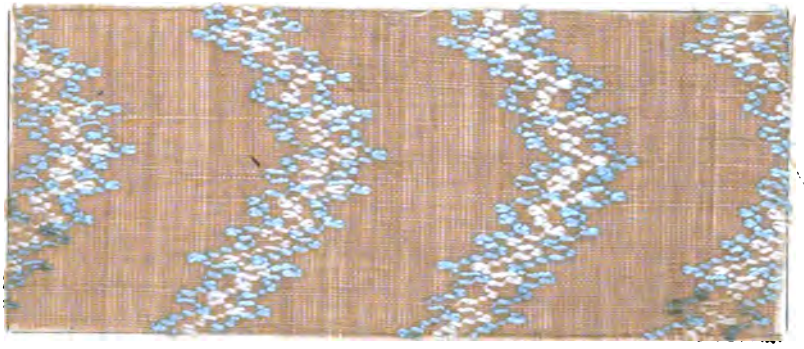
Both of the common makes of dobbies can now be had, with attachments for producing two different weaves, alternately, without the long harness chains formerly necessary. I refer to such work as towels, with fancy woven borders, the filling satin bars of barred muslin, etc.

In line with all these minor improvements for convenience and economy, the makers of the Northrop loom are now building it for one hand only, so that one set of patterns or repairs will do for any loom, the shipper always on the left and the battery on the right, the pulleys on either hand. They have also adopted a metal cloth roll, obviating any trouble from the shrinking or swelling of the wood.

It will be evident, I hope, even in this brief paper, that we have in this country advanced in two ways: in variety and in fineness of woven product, and in the efficiency of our machinery. We hold first rank in the latter, and our progress in the few past years has been good in the former branch of industry.

Let us hope that by the aid of the textile schools, now beginning to receive their due support and such legislation as may be necessary for temporary protection, together with the business sagacity and perception which is a part of our heritage, we may be able, ere many years, to stand in textile art where we now rank in artisanship.

No. 4.



No. 5.

No. 6.

The PRESIDENT. This has been a very interesting paper. I think Mr. NICHOLS is prepared to answer any questions that the members may ask in reference to it.

Mr. WILLIAM G. NICHOLS. I might say, Mr. President, if anyone is interested in the samples of cloth which I have shown, or the photographs of the looms, I have most of them here and will be very glad to show them to anyone who wishes to see them.

The PRESIDENT. For the sake of expediting our work and keeping this matter of weaving in your minds, or at least taking up the other paper while it is in your minds, Mr. HAWKESWORTH will read his paper.

Mr. FRANK M. MESSENGER. Mr. President, before the paper is read I would like to refer to the first cut that was shown on the screen. I want to say that I was very much interested in Mr. NICHOLS' paper; it was very instructive indeed, and it was very interesting to me at least. Referring to that first cut of the loom, I did not, perhaps, quite understand it. If I understood it, it was a device for changing the shuttle so that it was practically a filling changer without stopping the loom. Am I correct?

Mr. WILLIAM G. NICHOLS. Yes, sir.

Mr. FRANK M. MESSENGER. In other words, it is a device supposed to do the same work as the Northrop loom, only to accomplish it in another way.

Mr. WILLIAM G. NICHOLS. I understand that that is their intention. It may find a field in some goods that the Northrop loom does not at present enter. I do not know whether they are weaving very much filled goods or not; perhaps Mr. DRAPER can tell us. I see no reason why this loom should not do it. I do not think they are in very extensive use, but they have been preparing it for the market and are now ready to put it out. It is intended to change the filling while the loom is in motion.

Mr. FRANK M. MESSENGER. I do not understand that that is applicable to box looms.

Mr. WILLIAM G. NICHOLS. No, sir, it is not applicable to the box loom.

Mr. FRANK M. MESSENGER. So that, so far as I can see, it does not cover any field that the Northrop loom does not cover today.

Mr. WILLIAM G. NICHOLS. When I said that it might enter some field that the Northrop loom does not, I referred to the matter of twilled goods. Is the Northrop loom in use extensively for twilled goods?

Mr. FRANK M. MESSENGER. Mr. DRAPER is right here; he can answer that question.

Mr. GEORGE OTIS DRAPER. Mr. President, I will say that we have not entered that field, although we are fitting up some sample rooms for those goods. We have not as yet started any looms for those goods, although we have taken orders for some.

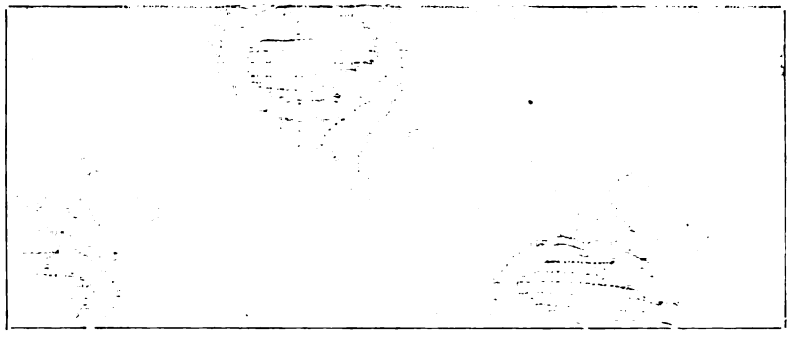
Mr. LOUIS SIMPSON. I would like to ask wherein that loom will be better than the Northrop loom for twilled goods. As I understand, the trouble has been with broken picks in cloth.

Mr. WILLIAM G. NICHOLS. I do not see that it will. I do not appear as an advocate of the loom, of course; I simply show it for the information of the members. But there are certain kinds of goods where a mispick is not of so great importance.

Mr. EBEN S. DRAPER. Mr. President, I simply wanted to say in regard to the use of the Northrop loom on twilled goods, I did not hear what this other loom was and I had come forward to ask about it a little further; I was a little late in coming in. The Slater Manufacturing Company of Woonsocket are today running a lot of looms on twilled goods. The Amoskeag Manufacturing Company, after putting in eight, gave me an order within a few days for a lot of looms. I simply want to give that information as something a little more recent than is generally known.

Mr. GEORGE OTIS DRAPER. Mr. President, when I spoke I was referring to five-harness twilled and was not thinking of the three-harness.

The PRESIDENT. Are there any other questions to be asked



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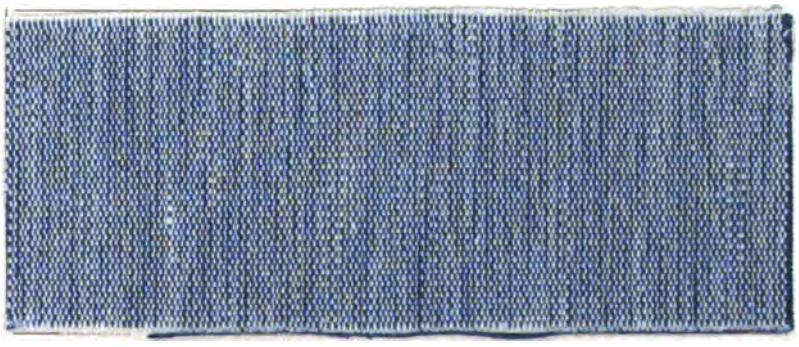

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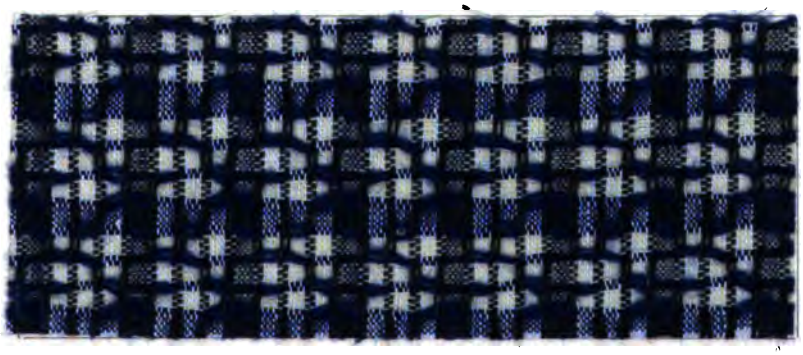

No. 9.

of Mr. NICHOLS? We would like to have the discussion of these questions in the hall, so that they may get into our Transactions. I understand that there are some splendid discussions conducted out in the lobby, and it has been intimated that in the future we might keep a stenographer out there well as in the hall.

Mr. HAWKESWORTH will now read his paper on "Weaving as a Fine Art."

WEAVING AS A FINE ART.

ALFRED HAWKESWORTH, Montreal, Canada, Province of Quebec.

The history and progress of weaving and the artistic ability that is displayed in the various fabrics that are handed down to us from ancient times show conclusively that the weaver was, in nearly every instance, his own designer and that he prepared his own warp and weft and built his own fabric. To do this acceptably to the criticism or favor of those purchasing for use the products of his loom, soon caused the most skillful to be sought after and encouraged the making of those wonderful cloths in silk, wool, linen and cotton, that have been preserved to us from the looms of Egypt, Persia, Italy and the Netherlands. The looms of India have given us our most wonderful cotton fabrics, not in any sense to be termed fancy, but although plain, yet in the highest degree artistic.

Who can say that he who first conceived the making of those gauze-like fabrics for which the native Hindoo has become distinguished was not an artist in the highest sense of the word, or that the fabric itself was not a work of art, however crude the machines may have been that prepared the yarns and enabled him to put the fabric together. We may smile at the idea of building a piece of plain cotton cloth, but the vocation has been practised for a great many years, and the attempt is still going on, and who is there among us who will say that he has arrived at the best formula for constructing a special or general fabric, and has at last found something that will just suit everybody wanting for use a piece of such cloth. The master weaver of today rarely, if ever, builds his own fabrics. The mill does this for him, and he manages or runs the weaving department to produce as many yards as possible for as little money as he can.

The goods may be constructed upon very poor lines, and the weaving may be saddled with more than its share in making the mill profitable, but still the work goes on. The goods do not sell as readily as may be desired and then comes fault found with the converter. No particular piece of cotton, or even any other kind of goods, can be made so that it will suit every requirement and we should therefore study the use to which particular goods are to be put, and so build them that they will be the best for such purpose made. On these lines depend success, without them, failure. The fine art of weaving plain cotton goods is not to be despised. There is, or should be, method in every department of a cotton mill, and in nothing, more than to give an ideal appearance to the fabric, for which the whole energy of the mill is concentrated. We may treat this carelessly if we think that the goods have to be converted or finished in some way and perhaps think that it makes little difference, but in the quality of the yarns used. In this we make a serious mistake and one that it is impossible to remedy after the work is done. To construct, upon the best lines, goods for special or general purposes, due regard must be given to the character of the yarns that can be obtained, and such a formula must be employed as will give the very best effects to the brown fabrics. Poorly carded and prepared rovings will give you rough, uneven yarns, if everything is done in the spinning room that it is possible to do, and such a condition will show itself in your goods no matter how or when you look at them, but this is not always the secret of inferior goods. We need good cotton, even yarns, properly carded and spun, as a first requisite, to make an artistic piece of plain, twill or fancy goods. But we must not stop here and say that the weaving will take care of itself; it will not do so. There must be some skill and practical knowledge of the proper construction of cloths either for special or general purposes, or else the very best efforts of the mill will not find sufficient appreciation in the minds of purchasers to make its output profitable. Reputable cloths are, and have been for some time, a great factor in the sale and price of those goods.

Do not for a moment think that it is the name that sells the goods, for it is not; buyers are not fools and things find their level in the markets. You may carefully examine any particular make of goods that has been holding a large demand and you will find that it is the best that can be found for the particular or general purpose for which it is purchased. Cheese cloths are not bought to make shirts, nor prints to make sheets. The fitness of things is more considered than would appear at first sight. There are many different tastes and sizes of purses, and even if we are trying to meet what is termed a cheap or lower trade in price, we shall best succeed if we consider appearances in these goods before finishing, and not leave it entirely with the converter to make a saleable piece of goods. Yarns of the proper size and sleys to match with some degree of proportion and twist should be employed when we wish for the best effects. For instance, a No. 28 warp yarn, regular twist, should not be used with a No. 14 weft hosiery twist. The goods would be flimsy and soft but far from artistic in appearance. If it is desirable to use coarse weft with a fine warp the twist of the weft should be more than ordinary $\sqrt{}$ of No. $\times$ 325. The sley of warp should be higher than the number of picks per inch of the weft. The above formula will give a degree of quality in looks that the softer weft will destroy, particularly if the sley of the warp is lower than the picks per inch of weft. To weave fine warp yarns artistically in sleys as high as 80 or more, using very much coarser weft, the twist of the warp should be as high as the quality of the cotton used will permit, and in goods made after this formula superior cotton should be used, so that the elasticity of the warp yarns will assist the beating of the weft into place without causing those breakages that will otherwise entirely destroy the smooth effect in the goods.

PLAIN CLOTHS.

Manufacturers of "white wear" purchase certain lines of goods and the "counter trade" another. The grade of goods used by these two parties hardly ever runs much into each

other and it is well for us to study each class by itself. The sizes of yarns and the number of threads per inch should be carefully considered when building a piece of goods for any particular purpose, not for price but for effect. If for a special purpose, the uses to which it will be put should govern its foundation, and sleys and picks per inch should not be selected that are not out of proportion, either in one or the other.

A fine weft combines nicely with a coarse warp if the difference is not too great. A coarse weft with care can be used, with good effect, in a fine warp. Square goods can be made very presentable where sley and picks are in proportion to the size of the yarns. Soft twisted yarns, both of warp and weft, can be used in this formula, if sleys of warp are not too high.

Goods for the general trade form an important business in both brown and white. Goods for shirt makers and manufacturers of white wear are another class. Goods for the rubber and oil cloth manufacturers are another, while the lawn and cambric trade calls for a distinct and separate line. But the above line is more or less used in connection with all the other lines that are presented to the trade for a multiplicity of purposes.

The goods used and sold by the general trade or what may be termed the "counter trade" form the greater part of what are used by the housekeeper for all her wants, and it is of this class that most can be said. In looking over a collection of samples of this class one is at once struck with the similiarity and yet difference of them. A brand seems to designate the goods and yet it answers for a number of different makes, and the same make for a different number of brands. It seems rather to indicate the firm or finishing works rather than a distinct or different make. But, as I have said before, these things find their level in the markets, and the public places a value upon them that is not far from right, however much we may disguise them by stamps or tickets. Of course a piece of goods properly finished, or rather finished according to its own merits, can be made to present an appearance that will put the highest possible value upon it, but not on account of its finish make a

poorly constructed piece of goods of equal value with one that has more foundation to it.

In building goods of the class named, warp yarns as coarse as No. 20 can be used for brown fabrics, and this number should form an important part of the warp, while the weft should not vary more than 4 to 8 numbers coarser or finer, according to the number of picks of weft required, which, together with the sley, will determine the weight and price per yard. Goods that are more particularly sold in the brown rather than bleached should be built upon the following lines:

		Yarns.		Yarns.		Yarns.	
In. wide.		Warp.	Weft.	Warp.	Weft.	Warp.	Weft.
48 × 52,	34	No. 20 ×	No. 16	No. 20 ×	No. 20	No. 20 ×	No. 28
52 × 60,	34	" 48 ×	" 52	" 60 ×	" 64	" 68 ×	" 72
56 × 60,	36	" 52 ×	" 56	" 64 ×	" 68	" 72 ×	" 76
60 × 64,	36	" 56 ×	" 60				
64 × 68,	36						
68 × 72,	40						
72 × 76,	40						

The construction of goods like the above with the regular twist of warp $\sqrt{}$ of No. × 4.75 will give an elastic pliable cloth if the weft has a twist of $\sqrt{}$ of No. × 3 to 3.25. Cloths built on these lines will give great satisfaction to the housekeeper during the process of whitening by home methods of wash and wear.

Such cloths as the above should be woven in reeds where for the lowest sleys the wire should not be heavier than No. 15. The looms should be arranged so that the weft will be laid as loose as possible from having one-half of the warp threads in crossing to form the fabric slightly looser than the other, and therefore not binding or narrowing up the cloth. These will give durability and a fine, smooth appearance, together with that elasticity that makes a piece of brown goods very desirable to the user. A better and finer class of brown goods can be made from No. 24 warp and No. 28s to 32s weft. The sley or number of warp threads per inch in the finer brown goods should be from 64 to 76 and the picks of weft from 4 to 8 per

inch more. If it is desired to make this class of goods have a finer and smoother appearance, make the weft Nos. 36 or 38 and increase the number of picks per inch in the same proportion. The wire of reeds to be used in this fine grade of brown goods should range from No. 15½ to No. 17.

The same care to lay the weft in the goods as loose as possible, so that the cover and elasticity will be preserved, should be followed in this as in the coarser grade, and the same rules for twist may be followed with advantage to the looks of the completed fabric.

Before going further into the details of cloth construction from an artistic standpoint, let me say now, that in weaving any class of goods, either in the plain, twill or fancy, great care must be taken to have the warp beam wound true upon the slasher; that the gudgeons are central with the barrel of the beam so that they will unwind perfectly true. The whip-roll and breast beam must be square with the warp beam and rigid. The reed also must be true with all these and held in a rigid lay that also must present a parallel line to the whip-roll and warp beam. In a loom like the above the warp and weft threads will cross each other at perfectly right angles and present true lateral lines in the goods. This forms the basis upon which all cloths should be built from the mechanical side, and if carefully and consistently followed will save a heap of trouble in the goods used for special converting, the wider the more necessary. This is a point that should not be overlooked, and one that will give fine finished goods a much better appearance than if dealt with carelessly. How often do we see our heavy goods woven so that the edges for from 4 to 6 inches are in a full cut of 50 yards considerably longer than the centre if they could be measured. Light cloths or those made from fine yarns are the most sensitive in this direction and frequently give so much trouble to the converter that we lose the best effects in the finished product in the endeavor to dry and stretch evenly goods that have not been properly put together in the loom. In weaving the two extremes of either light or heavy cloths care should be taken to

see that the divisions of the warp come regularly and evenly into play, so that one part of the warp yarn does not operate the letting off motion more than the other. This is the cause of a great deal of bagginess in the centre of wide, light cloths and selvage stretching in the heavier makes.

The elasticity of good warp yarn will allow a great deal of error in the shape of harness cams. The starting and strapping of the same and the brown cloths will show little of the defects until they are being finished, then comes the trouble, and quite frequently we see a fine piece of goods that should present an artistic appearance, very much injured in this direction. I might say in passing, here is a point where the automatic letting off motion is superior to that of friction. Here, likewise, the fine art of weaving can show itself in selecting a good harness that is evenly knitted and in strapping it upon the harness cams with straps of even thickness, so that even shedding of harnesses will result, and that both edges of the cloth or yarn will have equal strain while it is being made.

Properly seasoned wood for harness shafts and of sufficient depth to prevent spring where picks are beaten into place will prevent bagginess in the centre of the cloth, just as a thick harness strap will cause a slack selvage by raising the shed a trifle higher on one side than on the other, thus straining the yarn a little each pick until in the course of weaving 100 yards or more you have stretched one side quite a number of inches more than the other. The defect may not show itself until the cloth is finished, and can be ignored in brown goods, but no, it will come up the first time it is washed, and in the finished product can never be made right, but has to be covered up and endured. You may say here, this is a great deal of trouble to take with a piece of plain goods, and it will not make it wear or be worth any more; but I say that it will make it worth more, if persisted in, just as it will be of better value to the consumer if put together so that it will wear evenly. If the better appearance does not make it command a higher price it will make it sell quicker and that is much to be desired. Let me digress here and say that our loom

builders have not given us a very mechanical oscillating motion for our harnesses. We batter and destroy them on account of room, and the flumsy way that they are strapped to the rollers; very often a slack strap caused by stretching ruins a set of harnesses.

The Empire loom builders of Stockport, N. Y., are the only parties, as far as I know, who have made any attempt to give us a smooth, steady, and so, to a certain extent, protected oscillating motion. While it is not quite perfect in its arrangement of the lower roll, yet with all, it is, I feel sure, the right principle, requiring nice adjustment of the harnesses and compelling them to be hung so that the sheds will get the same movement on both edges of the cloth on the same shed, and a steady, even motion to both. The size of wire in reeds and the depth between boke or ribs will make or mar the artistic appearances of the best woven cloths that are to be used for any purpose, in a brown state more particularly, and will have a proportionate influence when they are to be finished. Reeds made from wire as fine as No. 18 to No. 20 for fine yarns in high sleys should not be more than 2⅝ to 2¾ inches between the ribs. The shorter sweep of looms made expressly for fine weaving will allow a smaller shuttle and smaller sheds, and hence a shallower reed. The action of the shuttle in rubbing against the reed will cause the threads to oscillate and zig-zag so that the cloth will never get back in finish their proper appearance, and in the brown state will be far from artistic. We require in all reeds wire to be stiff enough when held in a good boke not to spring as the shuttle rubs against it in passing from one box to another. We always require the wire in reeds to be as strong and fine as will resist the beat or force of making the fabric and that we may get all the room for the yarn possible. The elastic reed caused by extra depth was a failure in more ways than one, and will not produce an artistic piece of cloth however you may arrange the loom.

Reeds for general work should never be made more than 3 inches between the ribs unless for long sweep looms, and then

the size of the shed should determine the depth. Reeds for warp yarns numbering from No. 12 to No. 32s for goods from 2½ to 4 yards per pound, should be made from wire of the following sizes:

48 to 52	sley,	No.	14	American	gauge.
52 " 56	"	"	14½	"	"
56 " 60	"	"	15	"	"
60 " 64	"	"	15	"	"
64 " 72	"	"	15½	"	"
72 " 76	"	"	15½	"	"
76 " 80	"	"	16	"	"
80 " 84	"	"	16½	"	"
84 " 92	"	"	17	"	"

The print cloth reed should be but 2¾ inches between the ribs, and wire not coarser than No. 15 to 15½. The reed draft for ordinary plain goods is generally two threads in one dent. When yarns are fine and sleys are open they should be drawn with only one in each dent. This will give a much more artistic piece of cloth and cause no more breakage unless yarns are quite coarse. This idea should be carried as far as possible on low sleyed goods where appearance is desired in brown goods. The thickness of the wire in reeds where fine yarns are to be woven, and where the wire is too coarse for the sley, will cause twoiness in the warp and disparage the value of the goods by their appearance, if something is not done to prevent it. We therefore hear a great deal about the cover of cloth, or we should say, about the regularity with which the threads are laid in both warp and weft. The art of the weaver comes in here, and he can do a great deal to remedy this evil, and to give his goods a smooth and glossy feel and look by the choice of wire in his reeds, the perfection of his harnesses, and the setting of his cams, whip-roll and breast beam. Still to aid him he must have a properly prepared warp sized neither too hard nor too soft for the weave expected from it, and weft of the twist suitable to the size of the yarns to be used. Brown goods for the salt bag and grain trade should be built upon the following lines:

For Sleys.	
40 × 48 42 × 52	No. 13 warp and No. 13 weft are the sizes.
44 × 52 48 × 52	No. 30 warp and No. 16 weft are the sizes.
52 × 52 52 × 60	No. 20 warp and No. 16 weft are the sizes.

You will note that the picks of weft are much higher in these goods than the warp, particularly in the lower sleys. This comes from the use to which these cloths are put, that is the making of bags, where the strain comes more heavily upon the weft than upon the warp.

The twist of both warp and weft in these goods should be about the same, if anything the weft should be the stronger, whether in bleach or brown. No cover is required in this class of goods save that of using as fine wire in the reeds as possible, and where practical to draw in the reed one thread only in each dent. Goods for the rubber and oil cloth trade that are plain should be made as follows:

Sleys.	Yarns.	Yarns.	Yarns.
48 × 48	No. 28 × 20 weft.	No. 28 × 24 weft.	No. 28 × 20 weft.
48 × 52	" 42 × 48 "	" 48 × 52 "	" 52 × 56 "
52 × 56			

The looms should be arranged to weave long cuts or rolls. The same twist should be given to these yarns that is used for general trade goods, particularly in the warp of √ No. × 5, and the weft should be twisted slightly harder than in goods made for the "counter trade" whether for brown or bleached goods, √ of No. × 3.50. Care should be taken to keep out reed marks or twoiness, but too much cover should not be sought after. Selvages should be made by not doubling too much, and care in setting of the harnesses should be exercised so that in shedding as the cop or bobbin on which the weft is wound nears the end and therefore causes a slightly tighter crossing, it will not be broken and cause loose places by the too early closing or changing of the shed. Thick or in any way uneven selvages must be avoided in this class of goods.

The sand or cloth roller must be kept true in size and perfectly straight. It is absolutely necessary that true goods are given to meet this trade just as it is that the lengths of the rolls be made to meet the size of the dry house. Goods for general use and more particularly selected by manufacturers of white wear, and not exactly the shirt trade, should be made as follows:

For Sleys.	
52 × 52 52 × 56 56 × 60	No. 28 warp and No. 32 weft are the sizes.
60 × 64 64 × 68 68 × 72	No. 32 warp and No. 37 weft are the sizes.
72 × 76 76 × 80 80 × 84	No. 32 warp and No. 40 weft are the sizes.

You will note here that the picks of weft are given always as four more than the warp. This rule can be varied and will add somewhat to the appearance, but not in an artistic sense. If real good effects are to be obtained this only can be varied 8 threads per inch and in some instances, particularly in the lower sleys, it will disparage rather than improve their looks. The weft yarns in the higher sleys can be made 8 to 10 numbers finer than the warp, and about the same number of threads per inch increased above what are used in the warp. If we are after nice cloths for this trade that will take a fine muslin finish and yet not be a lawn by any means, we must make our yarns finer and increase our counts. This may be more expensive, but he whose purse is not limited, and buys from quality only, will not object.

The coarser yarns in the low sleys being nearer of a size will give the best appearance and not make them too heavy or expensive. The finer warp requires finer weft in the medium sleys and will give a better effect than coarser warp with finer weft will do, and will also keep down the weight and render the goods suitable to a degree for certain purposes. The higher sleys re-

quire a still finer weft to give a smoother effect and not to add too much to the weight. In all the above goods, to be sure of the very best effects in the finished piece, care should be taken to have the warp yarns sized soft and smooth and regular twist of warp yarn used, but the weft should be twisted slightly harder than in the heavier and coarser goods used in the "shirt trade"; I should say $\sqrt{}$ of No. $\times$ 3½. The wire in the reeds should be carefully selected for size. The depth of the reeds should be from 2⅞ to 3 inches between the boke, less even if the loom has a short sweep. Goods of this class require a soft muslin finish and on account of the low sley, with moderately fine yarns, can be easily given a fine appearance, but if the yarns are twisted too soft the goods would require singeing before they could be made suitable and so become more like sheer or lawn goods, too open, which would render them of less value and make them not so desirable for manufacturing purposes.

Goods of this formula 52 × 56 and 56 × 60 with the yarns as fine as No. 32 for warp and No. 40 weft can be used for the window shade trade, but would then, with the extra twist of weft mentioned, still require singeing. The above formulas for construction are considered the best for opaque shades. They fill easily in finishing and with heavy calendering render painting quite easy. Goods for the shirt trade that are becoming every year of more importance and are almost entirely taking away the housekeepers' vocation in every article that enters into our homes, should be made as follows:

For Sleys.

60 × 64 64 × 68	No. 20 warp and No. 24 weft are the proper sizes.
72 × 76 76 × 80 80 × 84	No. 26 warp and No. 30 weft are the proper sizes.
84 × 88 88 × 92	No. 30 warp and No. 36 weft are the proper sizes.
92 × 96 96 × 100	No. 36 warp and No. 40 weft are the proper sizes.

The above goods should have a softer twisted weft than is desirable in the white wear class, $\sqrt{}$ of No. $\times$ 3, and never more than $\sqrt{}$ of No. $\times$ 3¼. These goods should be made from yarns more nearly equal in size than those used for white wear manufacturing, they not requiring a muslin but rather a thread finish. They should be sized as soft and pliable as the weave will allow; in other words, so that the yarns will fill up the interstices between the different threads and give the goods a full look and feel. The same rule of difference of four numbers of warp and weft and also of sleys, is the secret of good looks before as well as after finishing in this important class of goods. You will occasionally see a shirting made with a moderately high sley where a heavier or coarser weft is used, and an attempt is made to beat into the fabric more picks per inch of such weft than there are threads per inch in the warp. To attempt this will be found rather an uphill job, and even if such yarns and cottons are used as to make it practical, the goods cannot be made to look artistic, and while they are heavy nothing like their value proportionate to their cost can be realized from their sale.

Of course in these goods as well as in the class manufactured for the white wear trade, some of the rules laid down can be departed from with a degree of success, but it will be at the expense of looks and likewise give more strain to the warp. The shirt trade is becoming of great importance to manufacturers, and we should study its best advantage in building cloths that will meet its changing needs. I have reference now to the colored or printed fabrics of cotton that are more and more being used for this purpose. The hard twisted cottons will not dye in such perfect colors as will those made more soft; neither will the extremely soft sent the printers, as will the slightly harder, so that a knowledge of what a cotton is to be used for is indispensable to the proper and most satisfactory formula for building it.

The lawn or cambric goods that form a distinct class and that are converted into all sorts of styles, both white and printed, are entirely distinct from calicoes or print cloths, and they should be made as follows:

For Sleys.

64 × 68 72 × 76	No. 36 warp and No. 48 weft are the proper sizes.
76 × 84 80 × 88	No. 40 warp and No. 60 weft are the proper sizes.
84 × 92 92 × 100 100 × 108	No. 50 warp and No. 70 weft are the proper sizes.

The yarns in this class of goods should be of superior quality and the twist employed in both warp and weft nearer equal than in coarser goods. Warp yarns in the class mentioned can be used with very good effects 15 to 20 numbers coarser than the weft. The finer grade of sheer muslins are made on the above lines for construction using much finer both warp and weft, and their effects come from the quality of cotton used in preparing the yarns together with the special finish to which they are invariably subjected when they are to be used white. When they are dyed in solid colors or finely printed they loose their identity and are distinguished by their texture. In this class of cotton goods more than in any one class with which we are acquainted, fine wire for reeds and fine twine for harnesses are a necessity. The looms should be arranged so that the goods will be woven without cover and so that each thread will, if so desired by the finisher, show itself distinctly. The art of the master weaver can be used to great advantage in this particular line of goods and the nice adjustment of his looms will work him out a most beautiful fabric, or if unskillful hands are used, an entire failure. Light and heavy or uneven cloth will ruin his expensive yarns; thick curled or slack selvages will prevent finish. His whole efforts will be unavailing if a true and even piece of goods is not the result, and it can be brought about only by a thorough knowledge of the mechanism of the loom, and of those parts that are directly engaged in building the fabric. Before passing on to the next part of this paper, let me say in regard to print cloths that the generally accepted formula for construction of 64 × 64, No. 28 warp and No. 36 weft has stood the test for many years and is acknowledged as about right, but a careful observer will have

noticed that even the printer searches for cloths suitable to the effect in the finished fabric that he is after, so that now we find almost everything printed that has yet been in anyway constructed.

You will no doubt have noticed that in describing the various cloths that are being made in a multiplicity of ways, I have laid great stress upon the twist of the wefts and the cover of cloths, and that I have likewise drawn attention to the preparation of the warp for the loom by the slasher. These points cannot be given too much thought; soft twisted wefts are not always desirable even if the cotton does not object. Hard sized warp yarn refuses to agree with very soft twisted weft and will not make, in this particular way, as smooth a piece of cloth as a harder twisted weft will. The weft will cling to the warp and refuses to be beaten, and the goods will be rougher than if something smoother was passing between the threads. We therefore should give great attention to the perfection of our slashing by using such starches and such softeners as will leave our warps smooth and pliable. The excessive use of tallow should be forbidden in our slashing rooms. The fermented potato starch can be still used to advantage on fine yarns. Flour and farinaceous compounds should be criticized before being accepted, and so should corn starch for fine brown goods. Good pure potato starch used with antiseptics and a fine soft gum where the gluten of starch requires softening, are things we should study in reaching after the best prepared warp yarns.

To give cover and a soft feel to the cloth in a brown state, and when cover is not desired but an even tension of each division of the warp, and to assist in laying the picks of the weft in the most artistic manner possible, the master weaver must so arrange his loom that the movements of the sheds or divisions of his warp will be equal. The changes of the sheds must take place at about five-eighths of the swing of the lay, (if such swing be $4\frac{1}{2}$) then $\frac{5}{8}$ of $4\frac{1}{2} = 2\frac{13}{16}$ which taken from $4\frac{1}{2}$ will leave $1\frac{11}{16}$ inches. This should be the point or distance from the fell of the weaving cloth, where all changes should start from. Where cover is not

desired a straight line drawn from whip-roll to breast beam will be the position to arrange these two very important parts of the loom without reference to the lay. Where cover is desired the yarn in weaving must be slightly tighter on the bottom half of the warp than it is on the upper half. This can be brought about by raising the whip-roll or breast beam, or both, so that the lower half when the picks are beaten to place will be depressed one-half of the swing of the lay, or about 2¼ inches when a straight line is drawn from the whip-roll to breast beam and measured down to the race of the lay when it is resting in the centre of its swing. These figures can be varied as the weaves are light or heavy, but it will always be found of assistance in giving a good appearance to the cloth.

Of course where no cover is wanted but more even tension of sheds are required to prevent stretching, the proper position will be found in the centre of the lay swing that is to make all changes. Yarn stretching is of more importance in certain classes of goods than might appear to the unexperienced, but it is an error that creeps into nearly all classes of weaving, light as well as heavy goods. We find it coming into our cloth from a number of causes, chief of which is a defective sand or cloth roller, sometimes made so by a mistaken idea of the loom-fixer, or even overseer, that his selvages will weave better if he adds an extra thickness to each end of the cloth roller. I am sorry to note here that some of our heavy shirting goods are so woven to the detriment of looks in the goods, either brown or bleached. We find yarn stretching coming from a whip-roll that yields, from the wear of crank arms, particularly where these parts are made from wood and as they wear, the straps are tightened over a shorter arm, and thus makes the lay not square with the beam; worn and crooked beam journals and even a lay not as stiff as it should be for the work required from it and also a narrow and springy harness shaft. Any of these things will cause yarn stretching.

DUCKS.

This is the name applied to a certain class of heavy and often

doubled and twisted yarn fabrics in plain weaves. These goods are used for various manufacturing purposes but more particularly for sail cloths. They are made in various widths and weights as so many ounces to the yard. The construction should be upon the following lines:

For Sleys.

36 × 36—No. 16 warp, 2 ply and same weft are the proper sizes.
40 × 40—No. 20 warp, 3 ply and same weft are the proper sizes.
44 × 44 } No. 24 warp, 3 ply and same weft are the proper sizes.
48 × 48 }

The number of the yarns is the same for both warp and weft, and as weight is required the same rule of increase is followed in one as in the other, with very rarely any difference in sleys. The warp yarns are not usually sized in their preparation for the loom, and on account of their superior strength as compared with single yarns of the same number being doubled, they weave easily and will in consequence produce an even and smooth fabric. The elasticity of the yarns that forms an important factor in both warp and weft of this grade of ducks, assists the weaving very materially and enables yarns of great weight to be very easily beaten together. The cotton employed to make yarn for these goods need not be any better than for the better grades of "white wear," if as good. Yet on account of its superior strength, together with its elasticity and not being starched, with the proper care in arranging the shedding mechanism of the loom, a beautiful, smooth fabric is the result. In weaving all kinds of sail duck, more particularly in the wider and heavier weights, we soon become acquainted with the elasticity of yarns and learn how important it is in assisting the building of heavy fabrics and also in noting that a pliable and soft yarn of both kinds contribute a good share in making a smooth and close piece of goods. Starch, as I have often said, strengthens yarn, but it reduces its elasticity and in such a condition a warp yarn presents to the lay more resistance in beating the picks into position. Sail ducks prepared as above stated are nearly waterproof when woven, in consequence of the ease

and facility with which the various threads interlace with each other. The extra twisting of the single yarns when being doubled, gives that elasticity that can never be attained in single yarns no matter how good the cotton may be. Hence duck weavers have learned that they can produce a better and smoother fabric without starch upon the warp yarn than with it.

The assistance given to make cover and favor weaving heavy cloths from single yarns, is not needed here. The looms should be arranged so that all changes will take place when the lay is at the centre of its swing, so that the strain of shedding will be even and equal on both edges of each division of the warp. These goods will bear no unequal tension or stretching of the yarns either on the side or in the middle. The sailmaker will decidedly object unless the fabric is true. No finishing can help to straighten these goods, they must be ready and suitable for the market when leaving the loom. Ducks made for the salt bag and grain trade, as well as for shoemakers and other kinds of manufacturing purposes, are constructed invariably from single warp yarns. These yarns are doubled in drawing them into the harnesses and reed so that they act as though they were single. They should be constructed as follows:

For Sleys.

72 × 36—	No.	12	warp	and	No.	6	weft	are	the	proper	sizes.
80 × 40—	"	16	"	"	"	8	"	"	"	"	"
84 × 42—	"	20	"	"	"	10	"	"	"	"	"
88 × 44—	"	24	"	"	"	12	"	"	"	"	"

The extra size of the wefts in these goods is required on account of the finish as well as to assist in their being colored. A special twist should be employed in the weft so that it will easily flatten out under slight calendering and absorb the coloring easily when being dyed in the grey. This formula applies to shoe ducks and to those used in trunk covering. The bag trade calls for about the same construction as do the manufacturing, but they require the weft to be stronger than the warp, which is easily accomplished on account of its size if warp twist is used. Appearance in either the shoe or bag ducks is of little

consequence with the exception that in weaving the picks of weft should be matched so that the frequency of breaks will be avoided and the fabrics will be full, as built. Heavy sizing and filling or loading is practised in bag ducks to a great extent, so that a rough exterior is of no account if the strength is there to stand the pressure of a certain weight of material into the bag of a certain size.

DRILLS.

A furrowed or twilled cloth, where the number of divisions of the harnesses are three, have come somehow to be called a drilll. The rubber and oil cloth, as well as the shoe trade, have become great consumers of this class of cottons. The standard drill is now a staple article in our markets. It is made upon the following lines:

For Sleys.

72 × 48 } No. 20 warp and No. 12 weft are the proper sizes.
72 × 52 }

80 × 52 } No. 20 warp and No. 16 weft are the proper sizes.
84 × 56 }

The yarns of the warp should be smooth with a liberal twist at least √ of No. × 5. The warp should be given a good quantity of starch and not too much softener, while the wefts should be nearly warp twist, about √ of No. × 3½ for mules. It is absolutely necessary that a perfectly true and firm fabric be given to the trade or they are about worthless. Cotton should be selected that will give a round firm thread with the twists mentioned. Very soft upland cottons are not suitable for this class of fabrics.

The art of the weaver can display itself in the arrangement of his harnesses so that a smooth face or back of the goods is the result. In weaving with cams and where an odd number is used as in this grade of cottons, there is great danger of what in weaving room language is termed "slack sheds." This comes from there being no opposite to every cam, so that the regular pull and take back is not matched; there being an odd number

necessitates a slack until the top roller of the harness loops is acted upon by the cam as it changes from back to front on a fresh round. If the strapping to the cams is not carefully and evenly done, slack selvages and ridgy cloth will follow.

To accomplish a smooth weave in these goods, the whip-roll and breast beam should be nearly or quite as low as the race of the lay. The strapping of the harnesses above and below on the first and third cams should be carefully balanced, while the second or middle should be given all the freedom that is practical. If the above rule is followed it will result in allowing the cam to revolve easily and move the harnesses without jumping, while the lift and depression of the middle or slack shed will be governed by the nice adjustment of the front and back. The reed draft in drills should be for artistic goods, two threads in one dent, so that the warp lines may not be too marked. If much coarser weft is used than warp, a reed draft of three in each dent can be used, and it will a great many times help a tender warp or a hard weave, without very much injury to the looks of the goods. Drills are generally woven with the warp or back of the goods down, and the movement of the harness cams should be from front to back. This will cause the furrows or lines to run towards the left hand when looking at the goods with the warp face down. When they are turned over, and when they are looked at after the goods are painted or enamelled, the lines will run towards the right hand. This seems to add prominence to the twill either from some inclination the eyes have to look towards the right and thus follow the lines, or to look over them as we seem to do when the lines run from right to left. The construction of these goods makes them, with the weave employed, entirely backed with warp, and the threads being so many in number per inch greater than the weft, they add firmness to the finished fabrics besides giving them a quality in looks that is quite artistic. The high sley of warp also prevents the paint or rubber from penetrating through the cloth and thus ruin the face finish. Drills are likewise in the narrower widths used for light sails and manufacturing. These are made on the following lines:

For Sleys.

72 × 56
72 × 64 } No. 16 warp and No. 20 weft are the best sizes used.
72 × 68

These goods should be woven true and even and the yarns should have full regular twist, it not being necessary to give them such a full, firm fabric as is required by oil cloth and rubber manufacturers, yet fully as heavy in proportion to their width, being closer and finer in yarns.

TWILLS.

This class of cottons are similar in the furrows or lines shown upon the cloth in the drills, with the exception that they are not limited as to divisions, and while the lines run the round of the cam or pattern chain on the dobby they agree with the harness draft and are justly termed a straight twill. The shoe twill has a special construction and its uses are confined entirely to the manufacturers. They should be made on the following lines:

For Sleys.

72 × 36—No. 12 warp and No. 16 weft are the sizes.
80 × 40— " 12 " " " 20 " " " "
96 × 48— " 16 " " " 24 " " " "
104 × 52— " 20 " " " 30 " " " "

These goods are entirely warp faced and to give the lines prominence they are given two warp threads to one of weft. The character of the cotton used in making the warp should be selected so that in finishing the threads will not become soft. Bottom land coarse fibre cotton, that will give a round, hard thread under liberal twist, is the right kind to use in making warp yarns for these goods; to ease the weaving of the heavy warp and to draw the threads taut and snug, the cam, if one is used rather than a dobby, should be constructed so that the harness will remain stationary three-fourths of the revolution of the whole circle. The whip-roll and breast beam should be nearly or quite as low as the race of the lay. The whole effort of the master weaver should be to hold each warp thread taut and

snug and thus with a properly prepared warp give a clear, smooth and firm face to the goods. The high sleys are desirable in these goods to enable the lines to run nearer to a right angle and the coarse warp to give the line a round and wiry appearance. An even number of divisions should always be used in making these twills to assist in the prevention of slack shedding. The four harness weave of 4, 3, 2, 1, and the harness draft the same is quite frequently used, and it is the best on account of its convenience in handling. The Prunella twill is frequently made with warp sleys as high as 200, containing 40 to 50 lines per inch. The high sleys in these beautiful goods cause the lines to appear almost like single warp threads. The reed draft should be a full round, that is, four threads in each dent, and there is little danger of warp marks in the goods on account of this for the crowding of the warp will easily fill up the interstices.

In the Prunella division of shoe twills superior cotton, Egyptian or Sea Island, should be used in the warp. The weft of these twills should be spun with quite soft twist or the reverse of the warp, and in this case the appearance of the goods will be all the better for it. The idea is to draw out the warp threads as straight as possible, rolling them over the weft so that they will look as near like a twisted or twilled thread as possible when the fabric is built. It is to the perfection of the twilled lines that these goods owe their comparative value and a proper knowledge of the sizes of yarns combined with the sleys of warp, and the effect on these lines produced by giving prominence or to flatten by increasing the angle of these lines across the cloth. A desirable weft-faced fabric can be made with this weave if a very soft twisted yarn is used and with sleys as high as 64 to 76 with 8 to 12 picks per inch of weft more than the number of warp threads; also a difference in numbers of yarn, about the same giving the coarser yarn for the weft.

The printer can obtain beautiful effects from these goods in large figures suitable for draperies. To get the best results from this class of twill the weft should be made from soft, clean

cotton, or rather all the efforts should be put into the weft. If a fine fabric is wanted, very fine wefts may be used, and a much greater number of picks per inch used than threads per inch of warp, with corresponding improvement in the goods.

SILESIAS OR LINING TWILLS.

In direct opposition to the shoe twill or drill, the silesia is a weft-faced fabric, and while other forms of twilled goods have a reverse, are equally twilled on both sides. These goods properly made and finished are a very artistic staple in the dry goods trade, commanding a high price proportionate to the labor and cotton used in producing them. The silesia does not require a tape selvage, it being woven practically with one-half the warp above the shuttle; it will not curl when slackened or in finishing unless the threads are too much doubled on the edges, and by this means woven too tight or stretched by uneven shedding or an uneven cloth roller. The construction of these goods for the best effects should be:

For Sleys.

72 × 72 80 × 80	No. 28 warp and No. 28 weft are the sizes.
88 × 88 92 × 92	No. 32 warp and No. 32 weft are the sizes.

These goods are easily woven, and the sleys can be increased to a high limit, together with very fine yarns, but for the very best effects sleys should be square or of even number and so should the yarns. Very good effects can be obtained by using a weft about 10 numbers coarser than the warp and reducing the picks proportionate. But, still, if we are not considering price, but looks, the rule of "square goods" is just the thing. The twist in warp yarns should be regular as well as the weft. Soft upland cotton is quite desirable for use in making these goods. If for very high sleys, Egyptian cotton will add much to their appearance when finished or in the grey. The weave of these goods should be 4, 2, 3, 1, with harness draft 4, 3, 2, 1. This will divide the warp so that the one-half forming the lower

face will be alternated with that forming the upper face when shedding. The cam should be arranged so that all changes will take place at exactly half the revolution and the corners of the divisions of the cam should be nicely rounded, so that a smooth, easy movement will be given to the harnesses. The reed draft should be two threads in each dent in every case, or, no matter how fine the reed wire is, the grey cloth will have reed marks. The harness draft as well as the movements of the cams crowd the warp yarns upon each other; to avoid this a low whip-roll and breast beam will assist the tight forming of the twill lines, and rather separate than otherwise the different threads of the full draught. The silesia twill is often carried into the making of wide sheetings and when No. 24 to No. 26 weft are used in sleys as high as No. 80 with warp about 4 numbers coarser, a very superior fabric is the result. Night-robe cloths are likewise made in this twill but with lighter sleys and slightly coarser wefts. A very elastic and soft fabric is quite easily made in this way. This twill under higher sleys and finer yarns, can be used by the printer in effects suitable for pajamas and other fabrics of undress wear.

SATEENS.

The sateen may be justly termed a broken twill, or rather a twill whose line is multiplied in such a manner that the weft will present two or more lines or even no lines on the face of the finished fabric. The sateen is decidedly weft faced to such a degree that the warp threads are entirely hidden in the higher picked goods. This fabric seems to have been specially constructed to show the fine qualities of the higher grades of cotton. Combed yarns made from Egyptian or Sea Island cotton are the very best that can be used in the weft, giving a beautiful lustre in the best grades.

We learn from the older works upon weaving that a full satin or sateen weave should be made from 16 divisions of the warp, and that such a weave should read 16, 14, 12, 10, 8, 6, 4, 2, and then 15, 13, 11, 9, 7, 5, 3, 1, or 16 picks to the round. This

weave will form just as the 5-division or shade sateen, two lines, or rather be building one line upon the even and one upon the odd harness, as the fabric is being woven.

For very high picked goods with a corresponding warp to bind the weft the greater divisions are preferable, and assist the laying in of the weft, or, I might say, in getting the weft nearer a straight line. The nearer we can get the weft in a sateen to a straight line with but little binding and heavily picked, the more artistic a piece of goods we are making.

In constructing any grade of cotton sateens the very best rule to follow for sleys, until the goods become quite expensive, is to make the weft, in count per inch, twice the number of threads there are in the warp. The yarns should follow the same rule in the higher sleys and nearly so in the lower. The sleys should be as follows:

For Sleys.	
60 × 120 65 × 130	No. 25 warp and No. 40 weft are the proper sizes.
70 × 140 75 × 150	No. 30 warp and No. 50 weft are the proper sizes.
80 × 160 85 × 170	No. 40 warp and No. 70 weft are the proper sizes.
90 × 180 100 × 200	No. 50 warp and No. 100 weft are the proper sizes.

You will note here that in the formula of construction both warp and weft are multiples of five. This may seem a small matter, but practised, particularly in the warp, will assist in keeping the weft nearer the straight line. The lay out of both warp and weft agreeing with the cam and the harness draft, the building of the fabric will be humored, and by its regularity the face of the cloth improved. In the sateen more than in any other piece of cotton goods, it is absolutely necessary that the shedding should be true and even. The harnesses should be knitted with the eyes perfectly even. The binding threads of the weave should press upon the weft true, and not later at one edge than upon the other. Every eye in the harness that is

longer than its neighbor encourages irregularity in the face of the goods. The shuttle throwing arrangement of the loom should be nicely adjusted so that no more weft will be unwound than is necessary at each pick. Slack weft following the shuttle will give a much smoother middle to the cloth than will be found upon the edges, for about 10 or 12 inches on each side. The master weaver can assist in preventing this error by starting the cams late to make its changes, and thus holding the sheds open until the shuttle has a chance to draw the weft tight while it is being checked in the receiving box alternately.

The method of building sateens with five divisions, and of course five cams, while it is the handiest and likewise the most frequently used, is subject to a great deal of criticism on account of the danger of slack shedding and consequent irregularity of binding the weft. This comes from the same cause that we find in the drills. The cams being of an odd number there is not an even pull and draw. The necessary number of loops and rollers that are required to give and take the slack from the cams are very liable not to be adjusted with that nicety that will give even and regular shedding.

The even number of divisions above four is preferable on the the higher sleys and the "dobby" can be used then with the very best results. If an attempt is made on the lower sleys to use a four harness cam arranged so that it will build two lines of twill, one upon the odd and one upon the even harnesses.

The twill lines on account of the shorter distance between the binders and the great number of picks per inch required for the face will make the twill lines run too near a right angle, and thus destroy the sateen effect. If a higher sley is used the corresponding picks of weft must be used, so that this will still make the twill lines more prominent than in the lower sley.

From some practice as well as study, I am of the opinion that an improved "dobby" is the best shedding arrangement for even a five-division sateen. It may not be quite as handy as the cam, but of this I am not so sure. Of course I would avoid all spiral springs and jacks, and employ the long lever dobby,

and thus while pulling from above draw with a positive effect from below in moving the harnesses.

The low whip-roll and breast beam are required in weaving these goods, so that the yarns will have no chance to hang loose above the shuttle and not bind the weft with precision. The tape selvage is quite necessary in finishing these goods and it should be woven as loose as possible, by either doubling the picks of weft before crossing, or spreading them in the reed. If this is not done curled selvages are soon complained of.

The softer and lighter weft is so easily controlled by the heavier warp yarns that it is sometimes quite difficult to prevent this curling when the goods are being finished. Even shedding, true and parallel lines in beam, whip-roll, breast beam, lay and cloth roller, together with no stretching of selvages by doubling of threads and frequent crossing, will be found to be the remedy.

Weaving as a fine art can find its best expression in the building and arranging of fancy goods, but it is a subject of such magnitude that I will not attempt it in this paper, that has now grown too long. This part of the paper I will defer to some future meeting or give place entirely in this line to someone more capable of doing it justice than myself.

The PRESIDENT. It is too bad to feel obliged to hurry a paper so carefully prepared as this of Mr. HAWKESWORTH'S. I will call on Mr. GOULD to read his paper.

PICKING AND CARDING.

MARCELLUS GOULD, Norwich, Conn.

It is generally conceded that the picking and carding of the cotton mill is the foundation upon which the structure of cloth is built, as well as the quality and quantity. The good running work throughout the mill depends upon this department. All know that if the picking and carding be well done and the other departments are well guarded, but little if any trouble will be seen at any point. On the other hand, if this be poorly done, at no stage of the process can it be rectified, and more or less (usually more) trouble ensues all the way through. To get good picking and carding is the desire of every manager, and I approach the subject thinking that each of my hearers who is active in mill managing, is satisfied with what he is doing, that he is well equipped and has as good as any, and as well managed picking and carding departments as can be desired, and perhaps think there is no chance for improvement; and yet, can it be said that there never is any trouble from these departments?

Before reaching the subject matter you will allow me to touch upon a few general principles as to localities, systems of machinery and stock used. The quality as well as quantity depends very largely upon the stock. It is not expected that one can produce as good a quality, nor as large a quantity with low middling cotton as with good middling staple, being equal. Neither can one produce as large a quantity of as good quality single carding as can be done with double American system; yet the revolving flat cards I much prefer to the double carding system, and it is single carding.

Locality has very much to do with carding as well as spinning, for in carding I have encountered more trouble from a dry atmosphere than from too much moisture. My experience is that better results follow with carding in mills located near tide water, than in those situated in a high and dry altitude. And this leads me to observe that not many years ago it was said that cotton mills could not be successful in the South, on account of the climate; it was too hot and too damp, and other troubles too numerous to mention. The fact cannot be disputed that very many (too many for our profit) are running very successfully in the South. Some say now that they can never do as fine work in the South as is done in the North. Do not allow ourselves to be deluded in this respect. They lack only one thing for this—skilled labor—and this they are fast creating. They have several advantages over the North, and among them is the first selection of cotton in uncompressed bales. Some of you, and perhaps the major part, may think this of little importance, but if your grocer opens up a quantity of berries or peaches, your first selection from them is considered your good fortune, and is it any the less so in cotton? The method of cotton buying for the mills South is well nigh perfection, and of great advantage.

This leads me up to the subject of picking. To get the best picking the stock should be in the best possible condition before entering the first machine. If we should feed directly from the bale, every mill man knows that the same stock from an uncompressed bale would clean more freely than from a compressed bale, and require less power to run the opener. And as we get our cotton compressed, hence we should have it in prime condition before feeding into the first machine. And what is the best method for opening and preparing cotton for use? We may differ upon this point, and while some are careless and indifferent about it, others are over nice, and spend much time and money opening cotton which might be employed to a better purpose. If one is using all one grade and length of staple, grown in the same locality, but little time and money need be

spent in opening up such stock. But if a few bales of each grade from good middling to low middling, and from different States and localities, varying in length and strength of staple, are to be used, much care must be given to the opening and mixing. The best arrangement I have ever employed for opening and preparing cotton for use, is to have two cotton bins each of sufficient capacity, if possible, to hold one week's supply. These bins should be free to air on all sides, and the stock remain open a week before using, alternating weekly between the two bins. As soon as one is empty, refill. Thus the cotton is opened up and exposed to the air a full week before using, and my experience is that it cleans more freely, is not so hard for pickers and cards, and takes less power to run it. If it cannot be exposed a week, have as long a time as possible intervene between opening and using. To do this requires more room, but it will pay, and the man who has not opened his stock this way will be pleased with the results if he should ever do this. I have seen 150 bales of compressed cotton put into a bin that would not hold 100 bales of uncompressed. I need not say that there is not a mill man present who has not seen bale after bale of compressed cotton when opened, as solid as a mass of fibre could be made. To use such stock immediately after opening, or feed it directly from bale, is very injudicious, and all must know it works hard and requires more power to work it, when if this same stock was exposed to the atmosphere for a few days it would so change its character that it would not look or work like the same stock.

I prefer an opening room without any machinery in it, for more than one reason, which you will observe later. This is not so easy to get in an old mill, but can be had in a new one. And this room I like to have the top room over the opener picker, hoisting the bales into it, and after remaining open for the stated time, drop the stock through scuttles directly into feeders. If we have to open cotton in a room with any machinery let it be openers only, and in this case the room should be the first or basement floor, and from openers blown up to opener

head, in a room with intermediates and finisher pickers. I think all present will recognize the force when I say that the pickers with eveners should be in a room with air and atmosphere as unchanging as any room in the mill. The fans require a certain amount of air to do the work properly, and when once regulated so that they give us an even, level and uniform sheet, we should not either add to or take from their supply to any great extent. Where all the picking machinery is located in one room, and the cotton is opened in that room, the doors have to be opened in all kinds of weather to take in cotton, and I am sure all of you have seen your pickers making laps, with holes and bunches, especially so on cold, windy days in winter, or stormy weather. Most of us have regular days for opening cotton, and it must be put in regardless of wind or weather. Many stop their pickers to open cotton and rush it through, so to get the machines started again, for they have no time to lose, and in such mills is the cotton opened as it should be?

There are other reasons why cotton should be opened in a room for that purpose and not in a rush. The discovery of foreign matter, and falsely packed bales, and the complete opening of the stock, not the dividing of a bale into three or four parts and throwing it into the bin. Too much stress cannot be put into this matter of opening and mixing cotton, for it is important that we start right. When the cotton is fed from bins it should be taken from top to bottom. The air to supply picking machinery is an important factor, and where possible should be taken from spinning and dressing rooms, as well as the weaving room, thus doing good to each of these rooms. The air ought to be warm and dry for straight work, and when once regulated it should not be changed any more than the draft on a machine, for upon the supply of air depends the evenness of our laps, and with the revolving flat cards the laps must be as even as it may be possible to get them. Nearly all cotton mills now have the self-feeder, and there is but little that can be said of them except that they are a very important auxiliary to picking machinery.

The care of picking machinery claims our attention, and we consider it of great importance. There should be a system about this. There is no reason why a picker should not make just as good a lap at the end of five years as it did the first month, but it must have care. In some mills there seems to prevail the idea that all that is necessary to do to a picker is to oil it and clean out the seeds. This is but a small part of what should be done. Nothing need be said about the oiling except that pickers should be oiled regularly and when in motion; in fact all machinery should be oiled while in motion, if possible, and avoid danger. After oiling the care of pickers consists in keeping the machine supplied with cotton and cleaning; and the most important part of cleaning a picker is the cleaning of the inside. The best time I ever found to do this work was immediately after the noon hour, before starting up. My reasons for this are: the light is good, and as the overseer and second-hand in their rounds after dinner usually go into the picker room the last, they can give this cleaning their personal attention for a half hour, to a good purpose. My system when overseeing was to give one-half to three-quarters of an hour every day to thoroughly clean the inside of every picker. Remove the seeds and sand under beater, and grid bars leading to cage cylinders. The cage cylinders clean inside and out. Have all the air chambers leading to fans cleaned and wiped out, the sides under beaters leading from feed roll to cage cylinders wiped off clean, and the fan and fan shaft should be wiped off clean at least once a month. Most of you may say this is needless advice, and think it is being done regularly in your mills, but is it? I opine that some of you would be suprised if when you get home you would go into your picker rooms, stop the machines, lift up the bonnets over the beaters, and note the condition of ends of grid bars, also the sides directly under the beaters, as well as the air chambers. There will be an accumulation if it has not been attended to. The cause of this accumulation is that the fans have drawn the surplus oil from beaters and it has adhered to the various parts mentioned, while the

light dust and sand has adhered to the oil and it soon forms a solid mass if not cleaned off; and when this accumulates on the fans they are put out of balance, and your fan boxes begin to heat and wear, then repairs begin. If we can have only one side of the picker cleaned thoroughly let it be the inside by all means. It does not take very long to a machine to do this cleaning if done every day, and if done right is of lasting benefit. Holes and bunches as well as ragged selvages, are often caused by no cleaning inside, and often a picker is stopped more on account of non-cleaning by clogging up, than it would take to clean them as they should be, beside getting poor laps.

Picking machinery is often abused, crowded to gain laps, in order to get time to open cotton, and stop for high or low water and other purposes. Like other machines there is a limit to the amount they can do and do well. We will assume the system to be openers, two beaters with self-feeders, intermediate one beater, finisher one beater. The speed of beaters determines the production, and my judgment is that 1,500 revolutions of same should be the maximum speed for any ridged beater, and for a 36-inch, 9 ounce lap the feed should be adjusted so that it produces 1,800 pounds, or a 40-inch, 13 ounce lap, 2,600 pounds in 10 hours. That many pickers are doing more than this and doing it well I do not question. That many are doing less than this and doing it poorly cannot be gainsaid.

If 1-inch staple is the standard, the proper distance for beater from feed roll is ¼-inch. I prefer a beater that has run long enough to have removed the sharp edge it has when new, for it will be remembered that a beater running 1,500 revolutions per minute strikes every inch of cotton going through from 150 to 180 blows, and the beater should not be so sharp as to cut or break the staple. For the advance and great improvements made in picking machinery during the last ten years, we owe to the introduction of the revolving flat cards. These cards do not permit of a poor, uneven and ragged lap, and the more even and uniform we can get our laps from picker room, the better carding we can get. With eveners on both intermediate and

finisher pickers, laps ought not to vary over one pound or a half-pound either way from standard. The laps for the revolving flat cards should be weighed not less than six times a day, and as much care bestowed upon them as is given the railway heads in the double carding system; what is still better is to weigh every lap that is taken from finisher pickers, and if one is found to be over one pound from standard run it over again. If this is done faithfully the yarn will run as even as with the American system of double carding.

Perfect laps will not produce perfect carding unless the cards are in condition to do what is desired of them. There are many honest differences of opinion as to the best method of carding cotton. For all ordinary work I prefer the revolving flat cards, but for a nice job of carding, regardless of cost, for a high grade of white goods, there is not much room for question but that the American system double carding will produce the most perfect cloth, excepting combed cotton from revolving flat cards. In treating this subject of carding I wish you to bear in mind that I have reference to ordinary carding of average staple cotton, such as is used in staple goods. I do not consider the matter of any particular make, style or character of card clothing of so much importance as I do the putting of it on, and care of it afterwards.

There are various styles of card clothing all called the best: the needle point, side ground, plow ground, and surface ground, are all used, and do good work. I have had the best results from bright tempered steel wire surface ground, set in flexfort, or five-ply rubber body. I prefer fillets for cylinder as well as doffer, and for the small card as well as the revolving flat. We do not hear much of the needle-point clothing now, and the plow ground has had its day, and there is more round wire surface ground being used than for some time past. While it has been a very hard task to demonstrate that there is any clothing better than round wire surface ground, I know that after the plow ground clothing has run for a time carding cotton, it smooths up and does as good, smooth carding as any clothing,

but no better. Upon the putting on of clothing and its first grinding largely depends its life as well as the quality of work it does ever after.

Not very many years ago I visited a friend, and in going through his mill we passed where one of his men was clothing a cylinder. He asked me what I thought of the way he was having it put on. I frankly replied, "You are drawing it on too taut." My friend said to his man, "Do not pay any attention to what Mr. GOULD has said; draw it as taut as you possibly can. We do not want to ever draw it again." There were twenty cards clothed at that time, and in less than five years it was renewed, and no satisfactory carding was had from those cards during that time.

To put clothing on a card and have it just right is a nice point. I prefer to draw over the clothing rather than have a break out and have to renew. Sometimes a set of clothing will be put on just right and run for years without breaking out or having to be drawn over, while another card put on at the same time breaks out, and still another needs drawing over. Some may think this is in the wire or body which holds the wire. It may be, but I think more is in the way it was first put on. The principle of this is the same as putting a wire in a vice and working one way and another, or holding it in your fingers and doing the same; which will break first? I have heard many good carders say that when a cylinder needs drawing over "it ought to come off; never is good for much afterwards." The same rule holds good as to drawing clothing the second time as it does the first, and I have seen clothing drawn over the fourth time and last longer and do as good work as clothing from same lot which was drawn the first time only. All that is necessary is to have the clothing on just taut enough so that the centrifugal velocity of cylinder will not raise the clothing; beyond this takes so much life from the body and not as good results can be obtained. I draw cylinder fillets at a pressure of 175 pounds, let it remain one or two hours, take off and draw the second time at 250 pounds, and if I have to draw over a cylin-

der occasionally, I much prefer it to the breaking out of wire, or the parting of the fillet.

The grinding and setting of cards after the clothing, is the key-stone to the structure of clean looking cloth, and too much care and attention cannot be given this by the overseer. Carding is the final cleaning process before laying the fibres parallel. I prefer to grind hard enough to obtain a bevel near to an angle of 35 degrees, and whatever bevel may be given to the teeth it should be maintained, not grind hard at one time and light at another. I wish cards ground hard enough so that a person with good hearing can hear the grinder strike the wire all the way, when standing erect in front of the doffer, not bending over with ear close to grinder. A card ground thus, and kept so, will clean more freely and break less staple. I also prefer a grinding roll, if true, after the emery has become smooth. I think the most of you have noticed that a card ground with a newly covered roll strips harder than before, while at the same time it feels sharper. This is on the same principle that your knife ground on a coarse stone feels sharper than with the same grinding on a fine stone, when really the edge is only more ragged, while one can do the finer job with the knife ground on the fine stone. More attention should be given to the wire letting go of the fibre than to its taking hold. In other words, if a cylinder, doffer or tops strip hard, the grinding has not been properly done; they should all strip easy to be in proper condition, and kept so.

There are different opinions as to how a card should be set, and this difference comes in the setting of tops. All agree that the doffer should be set as close as possible and not touch the cylinder. I want the half of tops next to doffer set as close as the doffer, the other half graduated towards the feed roll, until the first top is three gauges away from cylinder, and the pitch of tops so that every wire on the tops is doing its share of the work; in other words the tops to be evenly filled. It is very important that the tops be in the best of order. Very good carding can be done with a cylinder where the wire is broken

out if the tops are perfect, but if this be reversed very poor carding will result. Hence why the tops on any card should be kept in prime order.

A card should be cleaned out and properly ground every two weeks, I care not if it be the large or small card. And if a card is not jammed or faced, one-half to three-fourths of an hour is long enough to grind; nothing is gained to grind longer, while much is lost. Any smart and interested grinder can grind 15 to 18 small cards per week, or 24 revolving flat cards in the same time, and if not too much other work is put upon them, they should be made to do this. But if you use the grinders for spare hands, to open cotton, clean drawing, brush down over head, clean shafting, and work at other odd jobs, they cannot grind as many cards or do it as well as they could and would if they were made to grind and do nothing else. I venture to state that if you all, when you get home, should go to your carder and ascertain how long your men ground your cards, many of you would find they ground them from two to three hours. And if you should ask them why they ground that long, they would say, "We learned that way, and want our cards sharp" (wire edge). When I was overseeing I made it a rule for myself, every Monday afternoon, to look the cards over critically, and if I found one card that was not doing its work as it ought, I called the grinder up, pointed out the trouble, and told him to remedy it. Sometimes they would say, "I am grinding towards that card and will be to it in a day or two." My reply would be, "*now*." If a card is working poorly never allow it to run a moment after being discovered, for it does not take but a little of poor carding to leaven the whole.

It is altogether more frequent than it should be to let things pass in the picking and carding, with the idea that the next operation will remedy it. Never put upon the cards what the picking should do, or expect the railway heads to do what the cards ought to do, or the drawing and roving frames to even up what the railway heads are made for. Every machine and operation should perform its function as well as designed, and they will do it if cared for as they ought to be.

I will touch briefly upon the railway head and subsequent processes. The sliver at railway head will always be lighter in the morning than it was the night before, more particularly so in cold weather; two to five grains per yard is frequent in winter. To overcome this I have the weight on trumpet lever moved out before starting, enough to meet this difference in weight, which can be determined by close observation, then as soon as the work from all the cards has passed the trumpet, do the first sizing. Size again as soon as the first stripping of cylinders is done, again at eleven o'clock, and three times during the afternoon. The first sizing in the morning and last sizing at night record upon a slate for that purpose, just as the weight is found, not after it is regulated. And this first and last sizing as found will serve as a key-note for the care of railway heads and the keeping of numbers. The cause of this difference in weight of sliver is the expansion and contraction of hole in railway trumpet. Some say the cotton expands and contracts. We know that cotton is more bulky in a dry northwest atmosphere than it is when the wind is south or east. To know if the trumpet expands and contracts, nicely fit a hard-wood piece to the trumpet hole on a cold morning, and then try it through the day to the same trumpet, same side up, and make a careful note of the weight of sliver at each weighing. It is the friction of sliver passing through the trumpet, together with warmer atmosphere in the room, that expands the trumpet hole, and this causes the sliver to become heavier. If the carder knows what his stock is before using, and will give such attention to his numbers as I have indicated, the number of yarn will never be far out. There is altogether too much knowing what stock is after it is in the yarn (too late). We should know what we are using before using it, which will give the carder a great advantage about his work, especially his numbers.

With the English system of carding the care given the railway heads in the American system should be given the intermediate and finisher pickers, as I have pointed out under the head of picking.

After passing the cards and railway heads we encounter the drawing and speeders, which is a series of doublings and drawings, all of which is simple and easy to handle. Yet there is roving made that spins very good, and some that does not spin as well. But if one gets good carding, and the railway heads run even, there is no excuse for making roving that spins poorly. The drafts from railway sliver to yarn ought to be easy, and not far from 4 first drawing, 4 second drawing, 4.50 slubber, 5.50 intermediate, 6.50 fine frame, 7 to 7.25 on spinning. Many are drawing more than this and doing good work; many are drawing less than this and doing excellent work. We know that we are obliged to put the drafts according to what we have to do with, having in mind the supply and demand from one operation to another, and there has to be a balance between each process, and the only way to get it is by speeds, or drawing more in one operation and less in another.. If possible there should be graduating drafts from spinning back to the railway heads.

Roving twists form an interesting subject for consideration, especially between the carder and spinner. The only safe rule is to have twist enough in the roving to go on and draw off well, without any stretching in drawing off. My starting point is to multiply the square root of number by 1.28; coarse slubber roving would need less, while finer than 6-hank would need more, unless long staple cotton was used. The carder with good judgment will never spoil his roving with under or over twist. I have often been asked if, when figuring through the carding, I take the twist on roving frames into consideration; my answer is, never. My reasons for this are: while it is very desirous to run the tension on roving frames as slack as possible and have the frame run well, yet in winding the roving on the bobbins there is more or less stretch given the roving, and it cannot be avoided; this stretch will offset the take-up in twist. It may be said that we should not stretch the roving in winding on to the bobbin, which in theory is true, but in practice there is no way to prevent it. There is not a bobbin or roving made but what is stretched in going on, and I am of the opinion that

it is at this point, and by the right manipulation of gearing, that some carders make better roving than others with equal and like machinery. Much more might be said about the care and treatment of roving frames, but this paper has reached greater length than it should. I will touch upon a good method for reducing double and single roving in the carding department, and bring it to a close.

I think I can say with accuracy, that there is not a bobbin of double or single roving made but what the speeder tender knows it; and why should it get into the work? It is mostly made while creeling, or allowing pieces to be run up on end of frames which are always running out, and as the tender cannot be there at all times, many a "little bit" of single runs, and as they think it is only a "little bit" it will do no harm, and so let it pass. My way to avoid this is to divide the roving in back creels into three perpendicular sections, calling the front row No. 1, and the sections on back creels, 2, 3 and 4. In putting the roving in the first time: No. 1 use full bobbins; No. 2, ⅔ full; No. 3, ½ full; No. 4, ⅓ full. No. 4 would run out first, and when the tender was creeling this she would not have to travel but very little, and every bobbin in that section would be in clear view, and could not run single without her seeing it. And whatever pieces she broke out from No. 1 put in No. 2 to even up, and so on in all four of the sections; and whatever pieces were taken out from No. 1 lay up on the frame and use in No. 4 when that commences to run out again. Never allow any of these pieces to be run up on end of frame. After this precaution, the roving when doffed should be marked, and if one bobbin of single or double be found let the overseer take it to the tender; no other person should do it, when the overseer is in his room. And there should be a record kept, and if any hand made six bobbins in any one week they should be fined. This work the overseer should do, and if followed by him closely, very good satisfaction will result. I have practised this method when overseeing, and in a room producing 70,000 pounds per week, 4-hank roving, I could bring from spinning room, on one

arm, all the double and single that reached that room in a single week. In thread mills this is brought down to a very fine point, and why should we not do quite as well in the cloth mills?

I trust I may have said something of interest and not wearied your patience, and I thank you for your kind attention.

THE MANAGEMENT OF COUNTRY MILLS.

RUSSELL W. EATON, Brunswick, Me.

I wish to speak of the advantages and disadvantages of country mills compared with those located in manufacturing centres.

The principal reason for the location of most of the country mills was, I suppose, an available water power. And in many places this still is an advantage that the country mills possess. It is often claimed now that the cheapness of transportation and the high efficiency of engines render this item of little consequence, that a mill located at a convenient seaport can obtain its power so cheaply that it is not worth while to go to a country place and expend large sums for a water power plant. If this water power be unreliable, or if it be insufficient for a part of the year, thereby compelling the installation of a steam plant as an auxiliary, this argument may hold. But a mill with a reliable water power plant unquestionably has an advantage over a mill run by steam power.

Distance from the centres of supply and from large repair shops has been detrimental to country mills in the past; but with the rapid increase of transportation, telegraphic and telephonic facilities, this disadvantage of distance has of late years decreased. The same forces have also improved the condition of country mills in the delivery of goods to market. In fact, many country mills have been made, by these improvements, almost as accessible as those in the large centres.

Now with cheap power and generally moderate taxes, and with the disadvantage of distance largely overcome, why is it that so many spindles are added in and about manufacturing centres and so few in country places?

A person may well say that whether we discover the reason or not, there is a reason for a place becoming a manufacturing centre, else it would not be one; that there is a reason why many country mills have ceased operations else they would not have stopped.

The favorite argument is based on atmospheric conditions, and the shore from New Bedford to and along the Sound has been especially recommended by some writers. But in these days when methods have been devised for adding moisture and heat to the air in the mill, and no method discovered for reducing the amount of either, I think that this stretch of country has no great advantage over parts of the State of Maine, for instance, where severe dogday weather is almost unknown. And yet mills are continually built or enlarged in the former while many mills have ceased operations in the latter district.

One great objection to country mills may be found in the isolation of the plant as it affects the management and the operatives, and it is of that particular feature of country mill life that I wish particularly to speak.

A visitor to a country mill which has been a long time in operation, finds a community of workers living near the mill — many of the families residing in houses belonging to the company. To these families belong the operatives needed for the important parts of the mill work, and in the same families are found the persons that must be hired for the less important parts. Families often stay in these villages for years, the members as they grow up being taken into the work and life of the mill. The brighter boys are advanced to more and more important places, and we find in some country mills men who have never worked or rarely ever been in any other. This is very pleasant. There comes to be a certain comradeship through the whole mill. The overseers are still called by their first names, even by the littlest fellows in the rooms. All moves along pleasantly; the life inside the mill is but a continuation of that outside. As I have said, this is very pleasant. But there is another side to it. A community such as this, with

which many of you are familiar, may lack one element to make it successful. It may lack the energy due to competition; such a community is liable to get into ruts. A mill located near other mills and where the excellent work in one is heard about in another, receives thereby a stimulus to activity. I repeat, a country mill is liable to get into ruts, to cling to old methods. Now, to my mind, there is nothing worse in a mill than this. A self-satisfied feeling, an idea that "we are getting along first rate" is the beginning of a mill's downfall.

In large manufacturing centres improvements are in the very atmosphere. Inventions and modifications are brought promptly to these mills, while the managers of country mills oftentimes have to hunt for them. To the question then, whether country mills can hold their own or not, I believe the answer lies in the ability of the manager to overcome the inertia in the operatives, due to lack of contact with other operatives.

It is evident at the start that the manager himself must keep in touch with the latest thoughts. This Association is one of the best aids. He should attend the meetings and pick up many ideas by conversation with the members, often as valuable as those in the printed proceedings. Undoubtedly, local associations patterned after this one, which would afford the managers of mills located near each other an opportunity to meet frequently for interchange of ideas, would be very useful.

The manager can rely also, to a large extent, on his overseers in this matter. They will be found generally as ready and anxious as himself.

I believe that great encouragement should be given to overseers to pursue lines of experiment, having the improvement of the work in view. Local assemblies of overseers might be even more beneficial than those of managers, and the expense of such gatherings might well be met by the companies. Some mills have the good practice of allowing their overseers a vacation with pay, it being understood that a good part of the time will be spent in visiting other mills. This is not the sending out of spies; it is always based, of course, on an invitation for a return

visit. It is to bring about an interchange of ideas. At this point let me note that large mills having more overseers and second hands manifestly have an advantage over small ones.

Let us now consider for a moment the operatives. I take the position that operatives in country mills have more favorable surroundings than those in cities. They have more of the pure air and the sweetening sunshine; they are more in touch with the outside life. Certainly we ought to, and I believe we do, find healthier, more robust people in country mills, at least in some of them.

In such people, living for years in the same village, it is possible to inspire a pride in the reputation of their company in the quality of the goods produced. In working directly or through the overseers to engender in the operatives a kindly feeling and a desire on their part to make the company and its products take a high rank, the manager of a country mill will, to my mind, be overcoming the greatest obstacle to its success.

A COTTON SPINNING MILL AT CREFELD, GERMANY.

Contributed by the Department of State, Washington, D. C.

DEPARTMENT OF STATE, WASHINGTON, Jan. 18, 1897.

C. J. H. WOODBURY,

Secretary New England Cotton Manufacturers' Association,

501 John Hancock Building, Boston, Mass.

Sir:

Enclosed please find a copy of a despatch received by the Department from Consul DEUSTER, Crefeld, in answer to your inquiry concerning cotton spinning.

Very respectfully,

FREDERIC EMORY,

Chief, Bureau of Statistics.

UNITED STATES CONSULATE, CREFELD, Dec. 21, 1896.

HON. W. W. ROCKHILL,

Assistant Secretary of State, Washington, D. C.

Sir:

In compliance with instructions in Department letter of November 21st, and received at this office December 9th, I have the honor to submit the following

REPORT:

Under the name and firm of "Crefeld Baumwoll Spinnerei" (Crefeld Cotton Spinning Mill), a company with a capital of mark 1,800,000 ($428,400), has recently been organized in the city of Crefeld. It took quite a while until all the stock of

the new company — 1,800 shares at 1,000 marks a share — were disposed of. Up to date, only a site for the necessary buildings has been selected, and it is questionable whether the company will commence with the construction of said buildings before next spring. Preliminarily, the new company intends to spin No. 30, No. 40 and No. 50. The necessary machinery has, as yet, not been contracted for. In connection with this, it may be of some interest to state further that the cotton yarns used in Crefeld and its vicinity for the manufacture of half-silks and velvets are but rarely under No. 40; from this number to No. 120 and upward are mostly used, of which yarns the greater part is imported from England and some from Mülhausen in Elsass. For these yarns Egyptian cotton is generally preferred, since its quality is regarded as far superior to Indian and American cotton. There are several other cotton-spinning mills in this Consular District (Viersen and M. Gladbach), spinning yarns from No. 4 to No. 30, Eng. of Indian and American cotton, bought according to immediate, momentary prices, qualities, freights and duty thereon.

Another cotton-spinning mill at Verdingen on the Rhine, near Crefeld, is under construction, and will probably be in operation within next year. This mill will spin yarns of lower numbers, so that American cotton can be used. It is deplorable that but small quantities of American cotton are used in this manufacturing district, a district where the export of cotton and cotton-mixed goods to the United States amounts to such enormous sums. In order to increase the consumption of American cotton and yarns in this district, it would prove advantageous to consign a stock of such goods to a trustworthy person or firm in any city in this district, where cottons and yarns are used, so that smaller quantities could be obtained by manufacturers, if desired, as such is at present the case with English yarns, obtainable from consignees in bundles of but ten pounds.

I have the honor to be, sir,

Your obedient servant,

[Signed] P. V. DEUSTER,

U. S. Consul.

EARLY DAYS OF THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

COL. SAMUEL WEBBER, Charlestown, N. H.

The scheme of such an association was originated by JONES S. DAVIS, formerly agent of the Lyman Mills at Holyoke, and it came into visible shape as follows:

In 1854 I was building and equipping the Ward Mills at Indian Orchard, Mass., and as the turbines, shafting and ring-spinning on the Whitin plan were all built by the Hadley Falls Water Power Co., I had frequent occasion to visit Holyoke and to confer with Mr. DAVIS and Mr. BLANCHARD of the Hampden Mills.

It was a time of general improvement aud change in cotton machinery. Ring spinning was fairly introduced, although some spinners still stuck to the old throstle. GEORGE DRAPER was introducing the railway head and evener, and also the improved temple and shuttle guard. The Kitson opener was just coming out (the old one, with a needle-point wire cylinder, to tear open the lumps of cotton from the bale, before they reached the "beaters"). The "slasher" was "in the air," the Merrimac Company having imported and tried unsuccessfully an English "tape dressing machine," which Mr. BURKE and I saw in Europe in 1851; the speed of shafting was being increased, and altogether there were many things to talk about at these occasional meetings. Mr. DAVIS one day proposed to me that as there was quite a little colony of us out there in the Connecticut River valley, quite removed from the manufacturing centres of eastern

Massachusetts and Rhode Island, that we should form a little society to meet at each other's mills occasionally, and discuss these improvements and examine such as any of us had introduced. This was soon done. We had no charter, but called ourselves the Hampden County Cotton Manufacturers' Association, and our membership included Mr. ARTHUR L. DEVENS of Ware, Mr. BLAKE of Chicopee Falls, Messrs. ADAMS and LUND of Chicopee, Mr. MELCHER of Mittineague, besides Messrs. OTIS HOLMES, C. W. BLANCHARD, J. S. DAVIS of Holyoke, and myself. We met accordingly, two or three times a year, in an informal manner, until the great "crash" of 1857, when the Indian Orchard property changed hands, and I went to Manchester, N. H., to assume the position of manager of the Manchester Print Works.

In January, 1864, I resigned my position at Manchester, mainly on account of a serious throat trouble, which I thought due to exposure to the steam and hot air in the works, and the colds contracted in crossing the river in the winter to my house on the other side, and went to Portsmouth to endeavor to resuscitate the old and worn out Portsmouth Steam Mill, and to make spool cotton in it.

While there, in March, 1865, Mr. DAVIS, who had been formerly connected with the same mill, came to see me, and proposed that we should try and carry out the idea of our old Hampden County Association on a larger scale, and take in all New England. I liked the proposition, and we accordingly went to Manchester together that night, to see Governor STRAW. He was out of town, but we saw Mr. PHINHEAS ADAMS of the Stark Mills, who was pleased with the plan, and assured us of the co-operation of Governor STRAW. He also agreed to join us in calling a meeting of such manufacturers as we personally knew, at Young's Hotel, in Boston, on the 20th of April, 1865, and Mr. DAVIS took the burden of issuing a call in our names. I now come to the record of the results of this meeting, which reads as follows:

[A True Copy, Attest:]

"July, 1865.

"*Dear Sir:*

"Your attention is invited to the following Call and By-Laws of a proposed association of agents and superintendents of cotton mills in New England.

"At the suggestion of several gentlemen connected with the cotton mills of New England, and particularly those whose business calls them often to Boston, an informal meeting of cotton mill agents and superintendents, was holden in Boston on April 20, 1865, at Young's Hotel, to consult upon the propriety of forming a 'Cotton Mill Agents' Association,' for mutual assistance and friendly intercourse.

"The plan was approved by all the gentlemen present, and a committee appointed to prepare By Laws to be presented at a future meeting. A printed copy of these we now send you, and invite your attendance at the next meeting, which will be held at Young's Hotel, in Boston, July 19, 1865, at 1 o'clock, P. M.

"Very respectfully,

"J. S. Davis, *Clerk.*"

ATTENDANCE AT FIRST MEETING,

April 20, 1865.

Phineheas Adams	Manchester, N. H.
Sylvanus Adams	Chicopee, Mass.
D. M. Ayer	Lewiston, Me.
John Balch	Newburyport, Mass.
F. F. Battles	Lowell, Mass.
John A. Bennett	Woonsocket, R. I..
Thomas Bennett, Jr.	New Bedford, Mass.
*Thomas J. Borden	Fall River, Mass.
A. Briggs	Claremont, N. H.
A. D. Brown	Newburyport, Mass.
H. H. Brown	Fisherville, N. H.
William A. Burke	Lowell, Mass.
George W. Burleigh	Great Falls, N. H.
*Frederick E. Clarke	Lawrence, Mass.
Stephen Clark	Manville, R. I.
*Josiah G. Coburn	Lewiston, Me.
Jones S. Davis	Holyoke, Mass.
Samuel Fay	Lowell, Mass.

FRANKLIN FORBES	Clinton, Mass.
GEORGE W. FROST	Newmarket, N. H.
DAVID GILLIS	Nashua, N. H.
JAMES HASKELL	Saccarappa, Me.
J. W. HOLT	Slatersville, R. I.
*DAVID L. JEWELL	Newton, Mass.
*HERVEY KENT	Exeter, N. H.
EDWARD KILBURN	Lonsdale, R. I.
*JOHN KILBURN	Salem, Mass.
H. KIMBALL	Blackstone, Mass.
E. S. LESLEY	Newburyport, Mass.
CHARLES L. LOVERING	Taunton, Mass.
WILLIAM MELCHER	Mittineague, Mass.
*O. H. MOULTON	Lowell, Mass.
THOMAS F. PORTER	Fall River, Mass.
WALTER PAINE, 3d	Fall River, Mass.
CHARLES P. RICHARDSON	Mason Village, N. H.
BENJAMIN SAUNDERS	Nashua, N. H.
ISAAC R. SCOTT	Waltham, Mass.
CHARLES SHOVE	Fall River, Mass.
WATERMAN SMITH	Manchester, N. H.
ALDEN J. SNELL	Shirley Village, N. H.
E. A. STRAW	Manchester, N. H.
O. B. WARNER	Holderness, N. H.
SAMUEL WEBBER	Portsmouth, N. H.
D. S. WILLIAMS	Augusta, Me.

*Present Members.

The meeting was organized with E. A. STRAW for President, and J. S. DAVIS, Clerk. The following gentlemen were appointed a committee to frame a Constitution and By-Laws:

WILLIAM A. BURKE, D. S. WILLIAMS, SAMUEL WEBBER, FRANKLIN FORBES, J. S. DAVIS, WALTER PAINE, 3d, JOHN BALCH, EDWARD KILBURN, D. M. AYER.

The meeting then adjourned to meet at the same place on the third Wednesday in July.

A Constitution and code of By-Laws were accordingly prepared and submitted by the committee in July, but before that time the writer had become ineligible for membership under the

rules which he had assisted in preparing. The enormous fall in prices which followed the close of the Civil War, had found the Portsmouth Steam Mill heavily stocked with high priced cotton, in various stages of process, in the manufacture of 6-cord thread, and they had not capital enough to stand the fall and suspended, throwing him out of active employment in cotton manufacturing. The Willimantic Linen Company and the Hadley Falls Company also suffered severely, the loss in the latter case having been stated at $400,000, but they had sufficient capital to keep on in business.

The writer was engaged in various occupations for about four years, the last having been the examination and compilation of the industrial returns of the Census Bureau in 1870, when he returned to Manchester, N. H., and entered the employment of the Amoskeag Company, weighing the power consumed in the various mills in that city.

This business of weighing power he followed for the next ten years, attending all the meetings of the Association as an expert, and making reports to them of the result of his investigations, and these results were finally printed by and for the Association in 1876, and afterwards in fuller form as the "Manual of Power" in 1879. Increasing deafness, which made it impossible for him to hear a word of the discussions closed his attendance on the meetings in 1881, though he has always been interested in the reports of them, and reads them regularly as they appear in the papers; and it now gives him great pleasure to be able to send them the above copy of his memoranda of the origin and first meeting of the Association.

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TRANSACTIONS

OF THE

New England

COTTON MANUFACTURERS' ASSOCIATION.

Founded April 20, 1865. Incorporated Dec. 1, 1894.

No. 62.

ANNUAL MEETING.

HELD AT CHIPMAN HALL, TREMONT TEMPLE,
BOSTON, MASS., APRIL 28-29, 1897.

(Office of the Association)

801 John Hancock Building, No. 178 Devonshire St.
and No. 53 Federal St., Boston, Mass.

WALTHAM, MASS.
PRESS OF [illegible]
1897